



smart Sol

Assembly and Operating Instructions
Differential temperature controller for solar thermal
plants for drinking water heating and heating support

These Assembly and Operating Instructions are an integral part of the product.

- > Read Assembly and Operating Instructions carefully before using the product.
- > Keep them in a safe place during the product's service life.

Translation from the German original edition ©emz 2011 - Subject to modifications.

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These instructions describe installation, commissioning, operation, repair and disassembly of the differential temperature controller **smart Sol** for solar thermal plants.

For operation of the entire plant, the technical documentation of all the components used such as solar collectors, boiler, tank, pumps, mixers and valves etc. must be complied with.



Danger!

Assembly, connection, commissioning, repair and disassembly of the controller may only be performed by a qualified specialist!

The controller is handled by the operator of the entire solar thermal plant, i. e. as a rule by technical non-experts.



Danger!

The controller by no means replaces the safety components required under plant engineering aspects!

Make sure not to use the controller until you have thoroughly read and understood these Assembly and Operating Instructions and the safety provisions. Comply with all safety provisions and involve a specialist in case of doubt.



Important!

The fitter installing the controller must inform the plant operator about operation, functioning and the method of action of the **smart Sol**!

Keep these Assembly and Operating Instructions and all reference documents so that they are available if required.

When relocating or when selling the device, hand the documents over to your successor.



Danger!

The device in operation may only be made accessible to adults disposing of appropriate knowledge and experience!

Symbols used



When handling the differential temperature controller **smart Sol** and the entire plant, please make sure that the following safety provisions in the Assembly and Operating Instructions are complied with!

Danger!

Immediate danger for assets, life and limb!



Important!

Important information compliance with which is essential!



Note!

Useful information regarding handling of the device and the plant!



The differential temperature controller **smart Sol** is an independent electronic controller for surface-mounting which is used for the control of solar thermal plants.

The controller is equipped with a robust three-part plastic housing which can only be opened by means of tools (screw driver PH2).

Operation is effected by means of only two control elements; indications appear against a backlit colour display.

Before connection of the electrical system, the controller must be mounted firmly to a perpendicular, robust surface (wall).

For its own supply and the supply of the outputs, the controller must be connected to an electrical energy supply system in accordance with the technical data.



Note!

The device must be connected to the power supply via an earth contact plug or, in case of stationary electrical installation, via a disconnector ensuring complete isolation according to the erection regulations!

Assembly, connection, commissioning, repair and disassembly of the controller are only admissible in a specialist workshop.

To ensure correct operation, temperature sensors type Pt 1000 must be used - the sensor design does not affect function.

Each temperature sensor has two connectors which are equivalent, i. e. interchangeable. Thus, polarity reversal is not an issue.

The sensor lines can be extended up to a length of 100 m, to this effect, a cable cross section of $2 \times 1.5 \text{ mm}^2$ is recommended.

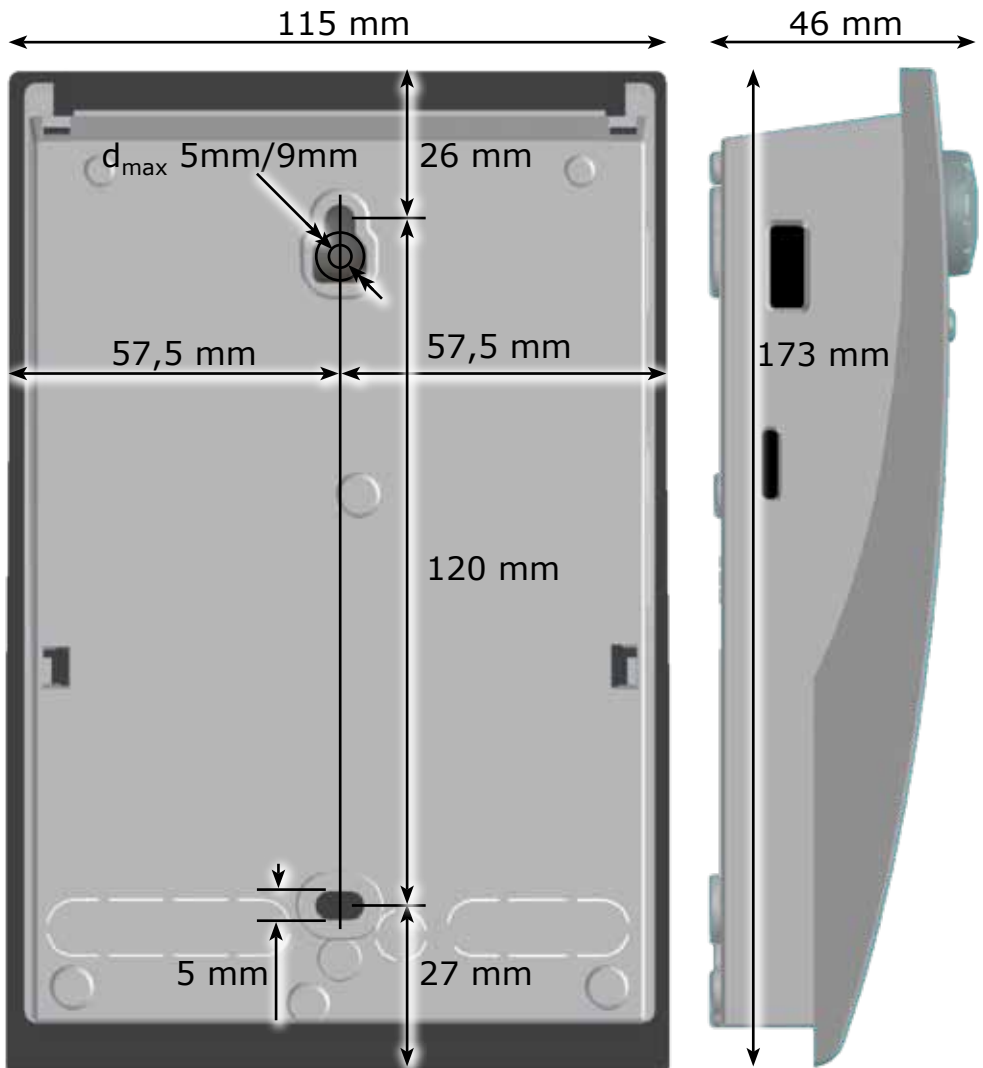


Important!

Make sure that only a dry or slightly moistened cloth is used for cleaning and servicing of the housing, the control elements and the display.

The surfaces must never get into contact with cleaning products or solvents - mat, brittle or slightly dissolved plastic parts must be replaced immediately!

A device with damaged housing must not be operated!



Intended Use

The differential temperature controller may be used exclusively as controller for the control of solar thermal plants. It must be operated within the scope of all the specifications described. Installation and set-up of the controller may only be performed by specialists. The fitter must have read and understood the operating manual. The fitter explains all the relevant functions to the operator. For operation, it is essential that the housing is closed and free of damage.

Scope of supplies

- 1 Differential temperature controller **smart Sol**
- 1 Instruction manual

Differential temperature controller **smart Sol**

Type of mounting	Wall-mounting
Housing	Plastics, in several parts
Type of protection	IP 20
Dimensions Width x Height x Depth [mm]	115 x 173 x 46
Weight [g] Basic version	370
Storage/operating temperature [°C]	0-40, non-condensation
Handling	via rotary encoder and pushbuttons
Display	TFT colour display 47 x 35 mm, backlit

Connection to power supply

Design	3 spring-type terminals PE, N and L
Service voltage [VAC]	230 ±10%
Line frequency [Hz]	50 ±1%
Auxiliary consumption typ. [W]	1,74
Power consumption max. [W]	3.5
Fuse	Micro fuse, type 5 x 20 mm, T2A
Rated pulse voltage [V]	2500

Interfaces TS 1 / TS 2 / TS 3 / TS 4

Design	2 spring-type terminals each
Assignment as inputs	
Admissible temperature probe	Temperature sensor Pt 1000
Optional assignment of TS3 / TS4 to the impeller sensor	DFZ 1-100 pulses/litre
Optional assignment as output on TS 4	PWM signal 100Hz...2kHz or analogue output 0...10V, max. 10mA

Triac outputs RO 1 / RO 2

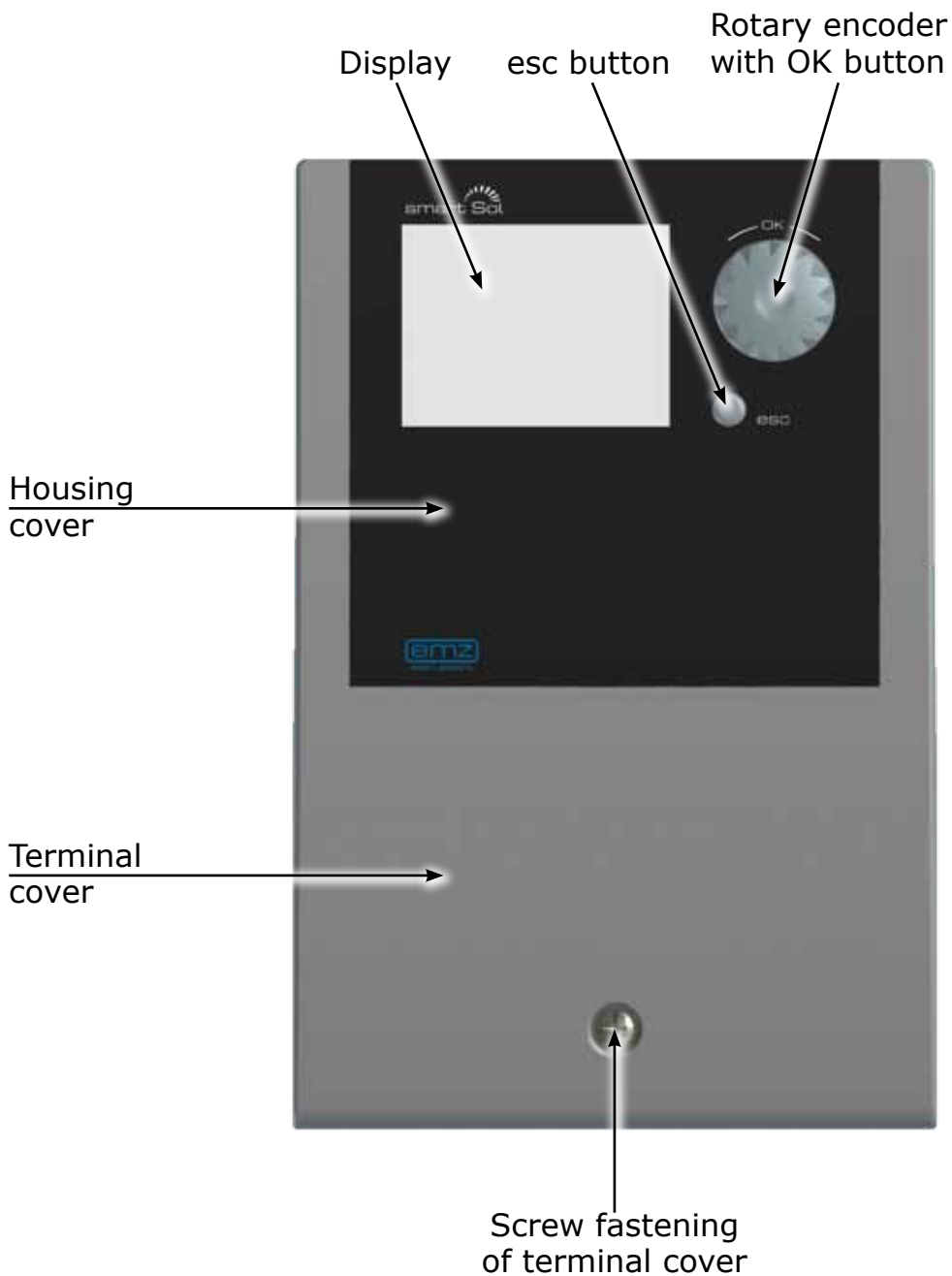
Design	3 spring-type terminals each, PE, N and L
Output voltage [VAC]	230 ±10%
Output power max. per output [VA]	200
Output current max. per output [A]	1

Switching output REL: Floating change-over contact

Design	3 spring-type terminals
Switching voltage max. [V]	253
Switching capacity max. [VA]	800
Switching current max. [A]	4

Max. cross sections to be connected

Cable end sleeve:	0.25 to 0.75 mm ²
Single-wire	0.50 to 1.50 mm ²
Fine-wired	0.75 to 1.50 mm ²





Housing
base

Spare fuse

Fuse

Terminals

Break-out
segments

Strain relief
device

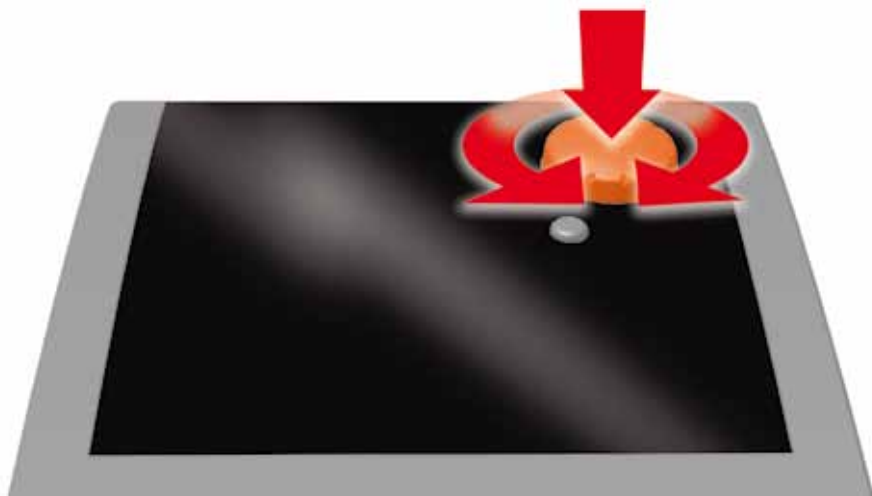
Drillhole for
securing bolt

The entire set-up and operation of the differential temperature controller **smart Sol** is effected via only two control elements on the device front.

All settings and interrogations are effected via the rotary encoder.

To find a required menu item, turn the rotary encoder to >scroll< through the menu - the selectable option appears on a coloured background on the display.

To confirm the selected menu item, press the rotary encoder. An appropriate submenu is called up, or selection is activated.



Press the esc button to make the menu return by one level from any subitem.

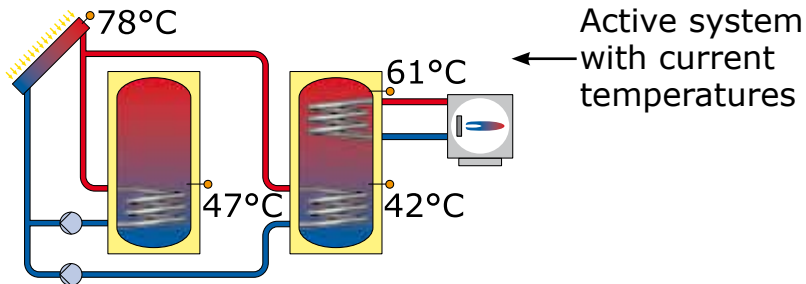
If no input is made within the preset time (30-255 s), the controller returns automatically to the initial level.



For indication of the operating mode and for communication in case of set-up, malfunction, modification and evaluation, the differential temperature controller **smart Sol** is equipped with a coloured full graphics display which is permanently backlit. The display is active as long as there is supply voltage on the controller.

After a preset time (30 - 255 s), backlighting is dimmed to 10%.

System 11



04.07.2011

09:16

← Date and time

Display elements; example: information screen

Number and name of menu

Professional mode

Manual mode

Message

1.3.2 Tube collector



n solar 1

100%

t solar 2

20s

n solar 2

30%

t start

6:00

t end

7:00

Selection menu

Activatable menu item

04.07.2011

10:35

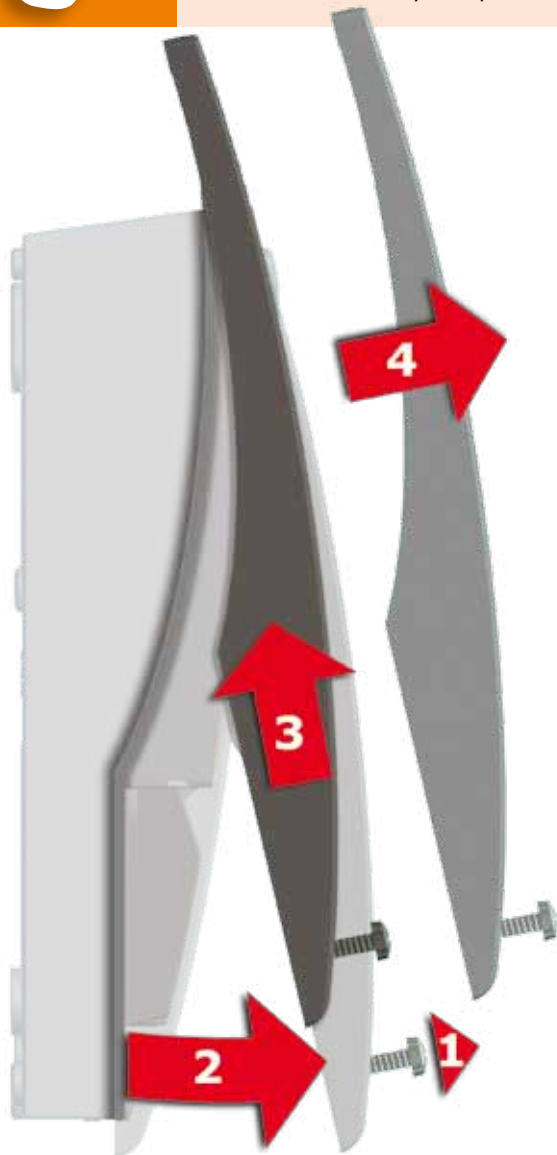
← Date and time

Display elements; example: communication screen



Danger!

Mortal danger due to electrocution! Whenever work is performed on the open terminal cover, all poles of the power supply must be disconnected reliably and protected against being switched on again!



1 Release the lock screw.

2 Swing terminal cover forward ...

3 ... push it upwards ...

4 ... and remove it.

Store the terminal cover carefully and protect it against damage!

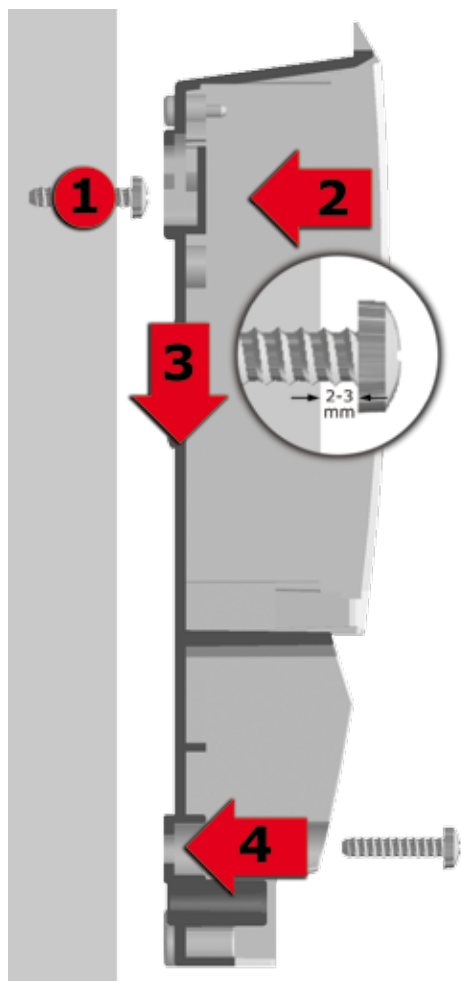
To close the terminal cover, reverse the opening procedure.

Important!

The device corresponds to protection type IP 20 - make sure the appropriate prerequisites exist on the envisaged place of installation.

Do not use the housing base as drill template.

A device with damaged housing must not be operated!



- 1** Fasten the top securing bolt so that a space of 2 to 3 mm is created between the wall and the screw head.
- 2** Move the device so that the upper fastening port is located above the screw head ...
- 3** ... and push it downwards.
- 4** Fasten the lower securing bolt.

If necessary, use dowel pins for wall-mounting!



Danger!

Mortal danger due to electrocution! Whenever work is performed on the open terminal cover, all poles of the power supply must be disconnected reliably and protected against being switched on again!

The differential temperature controller **smart Sol** is connected to the power supply via three groups of spring-type terminals which are visible once the terminal cover is opened.

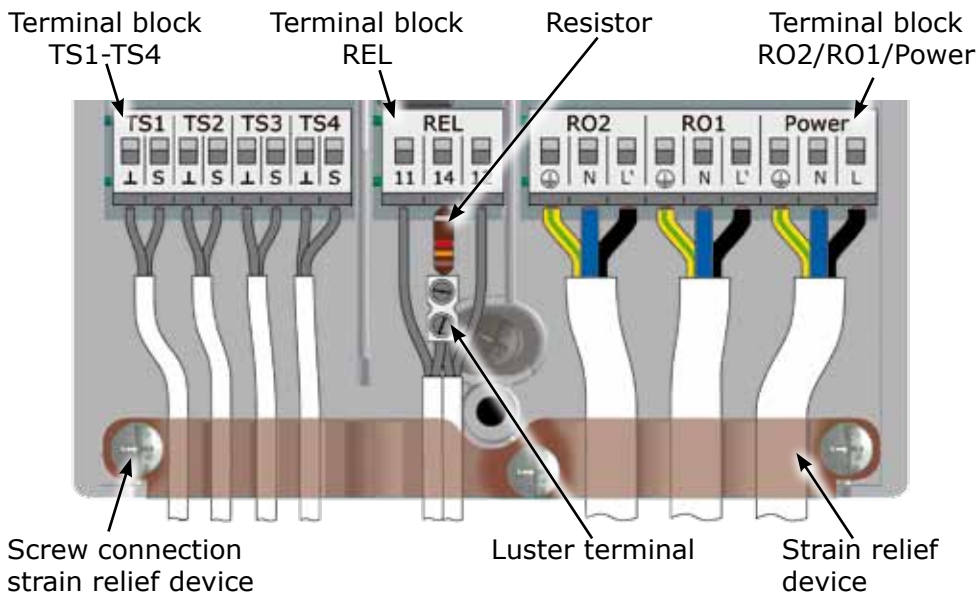
To introduce the cables, release the three screws on the strain relief device; if necessary, remove the strain relief device.

In case of flush mounting of the cables, the break-out segments in the housing base can be removed carefully and the cables routed through these ports.

The central terminal block is the interface to a floating change-over contact - here, it may be necessary to route electrical resistors into the spring-type terminals and to connect part of the cables via luster terminals.

The spring-type terminals for the power supply, RO1, RO2 and REL, and for TS1, TS2, TS3 and TS4 can accommodate solid wires up to a cross section of 1.5 mm². Appropriate stranded wires must be preassembled with cable end sleeves.

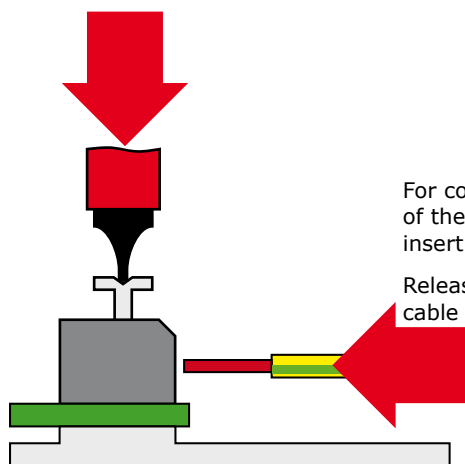
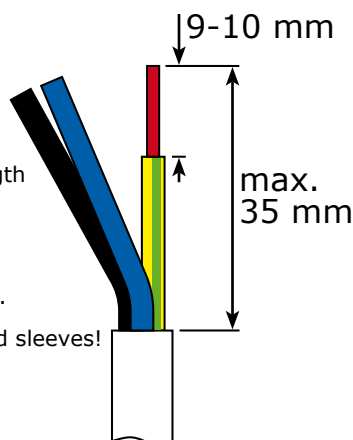
For the strain relief device function, TS1 to TS4 and REL require cable cross sections of at least 5mm, for Power, RO1, RO2 at least 7mm.



The strain relief device can only ensure solid clamping if the cables are not stripped to a length of over 35 mm.

Insulation of the individual wires must be removed over a length of 9 - 10 mm to ensure safe electric contact in the spring-type terminal.

Stranded wires must be provided with cable end sleeves!



For connection, press the actuation pushbutton of the spring-type terminal using a screwdriver and insert the wire to its stop in the appropriate port.

Release the actuation pushbutton and pull the cable slightly to ensure that it is safely clamped.

Important!

Before closing the terminal cover, make sure the strain relief device is tightened safely.

Check once more that all cables are in good condition and connected correctly.



Optional micro SD card:



The solar controller features the following data interfaces:

The recesses in the left-hand side of the housing base accommodate an USB connector and a slot for a data medium (micro SD card).

These interfaces can be used e. g. to read error messages or saved data or to transfer software updates to the controller.

Access to the data on the micro SD card is possible via the USB connector.

Only the SD cards authorized by emz may be used.

The micro SD card is detected by the controller automatically.

Before removing the micro SD card from the controller, the item ›Remove SD card safely‹ must be selected under ›1.2 Settings‹.

Optional volumetric flow sensor:

Measurement of solar radiation (heat quantity):

The solar yield is calculated from the flow rate and the differential temperature.

The differential temperature is the difference in the temperature of the collector sensor and the solar circuit return line sensor. There are various technical options:

a) Use of a vortex volumetric flow sensor with 2 analog signals for flow rate and temperature. The vortex sensor can be inserted directly at the plug connector provided behind the TS3/4 terminals. All plant layouts permit solar radiation. When a vortex sensor is connected to plug UI1/UI2, the cover plate at the housing must be broken out.



Pin assignment

Plug connector for vortex sensor:

1 = UI1 = Temperature sensor

2 = UI2 = Flow rate sensor



b) Impeller sensor (incrementation input)

An impeller sensor can be connected to TS3 or TS4 and must be adjusted during installation. The temperature sensor for the solar return line is connected to TS3 or TS4 and must then be set in the menu 1.1.4 Heat quantities. Solar radiation measurement using an impeller sensor is possible for plant layouts 1, 2, 3, 4, 5, 7, 10, 12 and 14.

Optional high-efficiency pump:

A high-efficiency pump can be connected via RO1 or RO2.

The appropriate control signal is issued at TS4.

Thus, TS4 is no longer available as input.

The control signal may be an analog voltage 0 - 10V or a PWM signal.

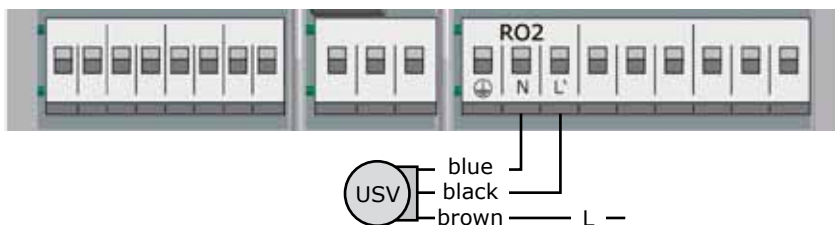


For further details, please refer to the pump specification.

For definition and settings, the professional mode under 1.1.4 has been provided.

Connection of a switching valve to RO1/RO2

Connection diagram for a switching valve to RO2:



Additional options:

- Option >Disable recharge NLU<: Description as of page 36.
- Option >Soft water station AQA solar<: Description on page 40.
- Option >Power reserve<:
This option can be used to buffer the time up to 8 hours in case of power failure.
- Option >acoustic signal transmitter<: The signal transmitter issues an acoustic signal once an error has occurred. This can also be deactivated in the menu.

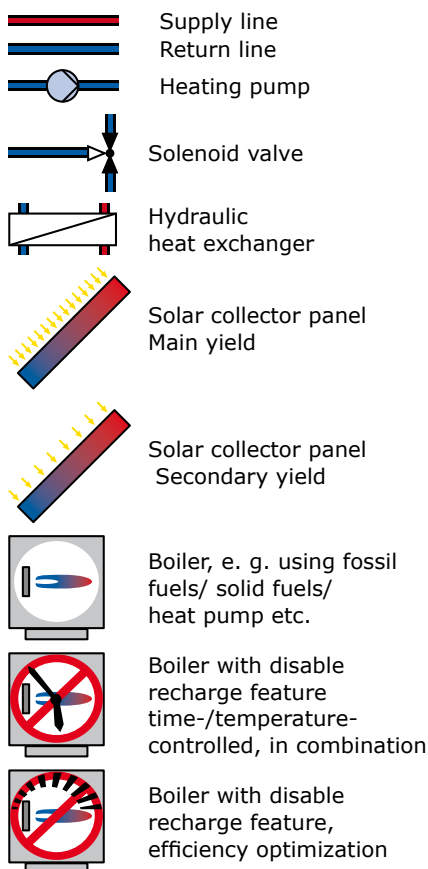


Note!

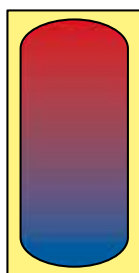
Define structure and design of the plant already when planning the entire solar thermal system and align the design with the one of the hydraulic systems of the controller!

If you want to complete an existing system or replace the existing controller, please make sure that **smart Sol** is compatible with the existing configuration!

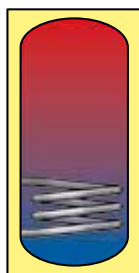
The sensors are connected to TS1 to TS4, the order not being significant; pumps and valves are connected to RO1 / RO2 - The interfaces are assigned to the functions in question on commissioning.



—●— Temperature probes



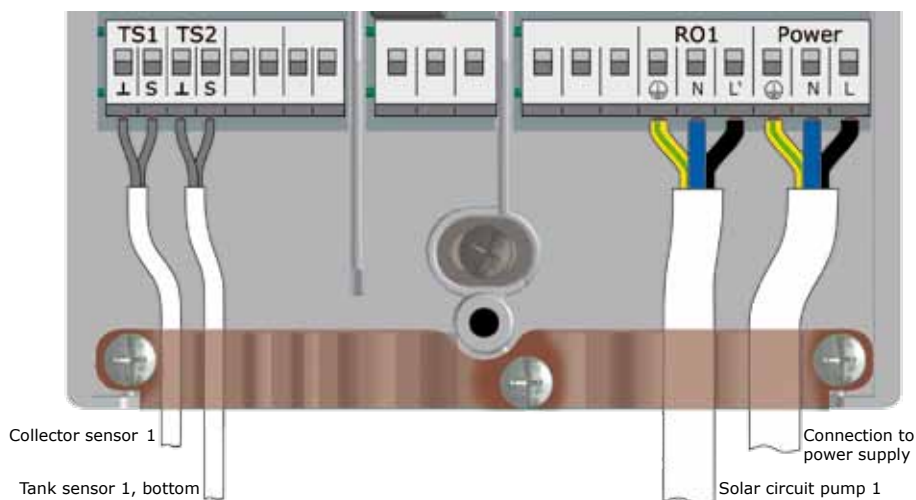
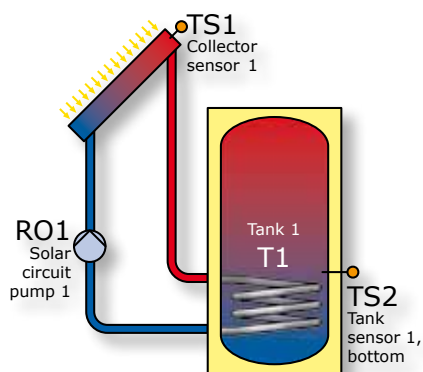
Warm water /
buffer tank without
heat exchanger

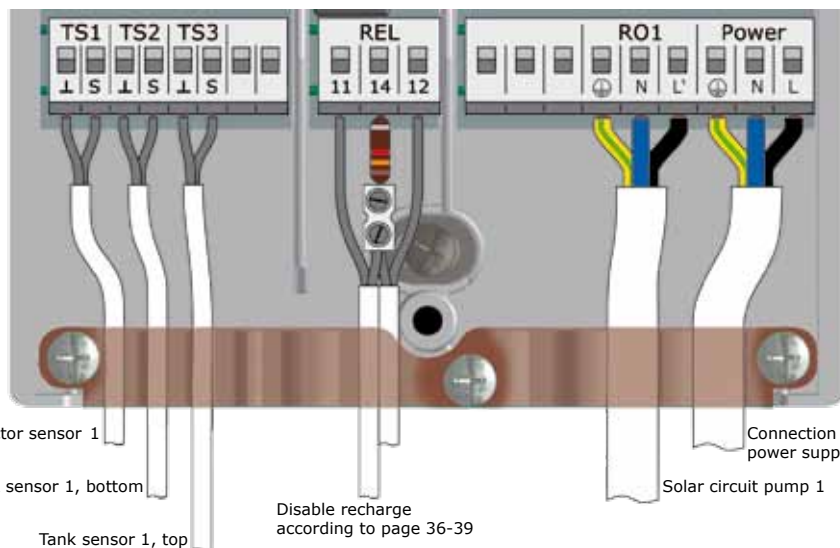
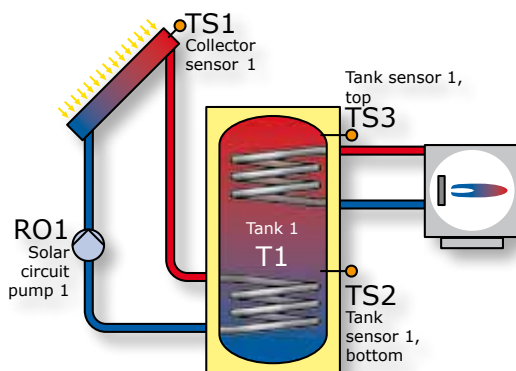


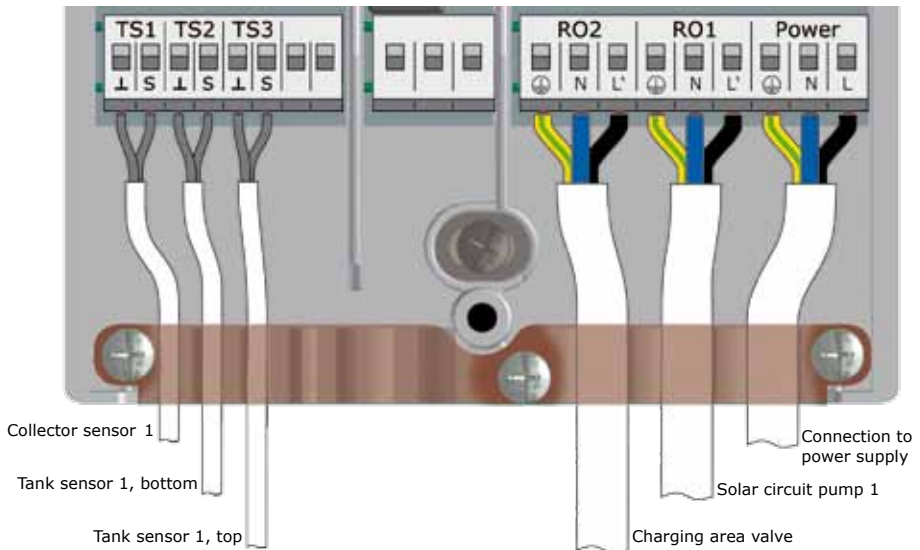
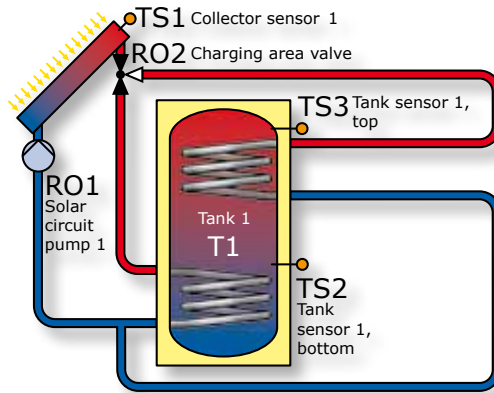
Warm water /
buffer tank with one
heat exchanger

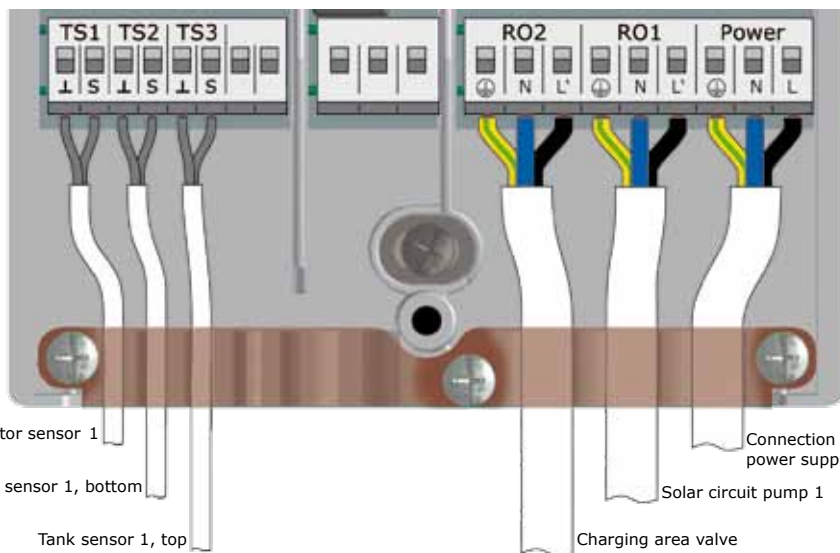
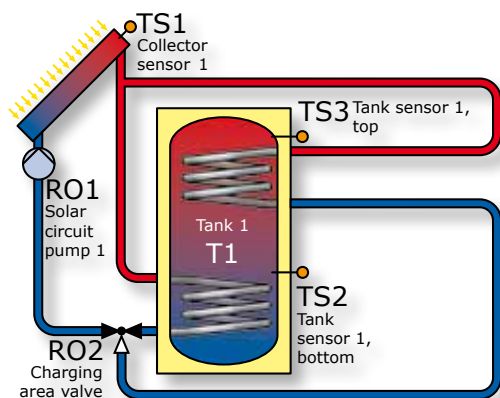


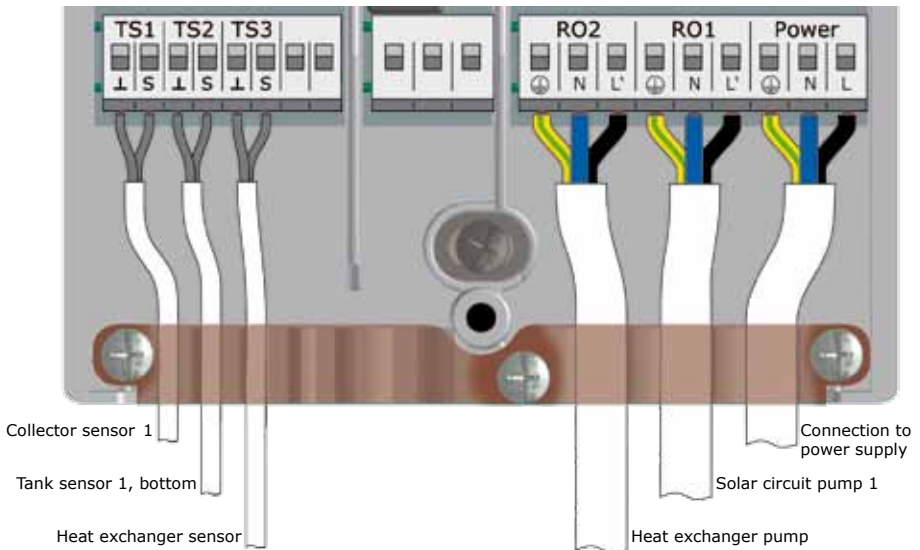
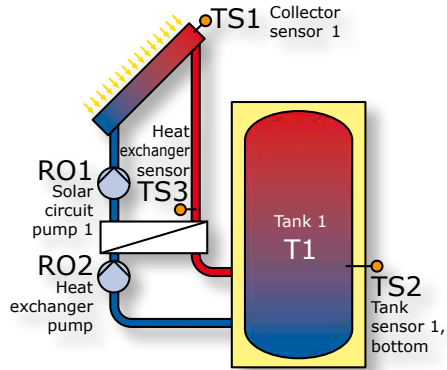
Warm water /
buffer tank with two
heat exchangers

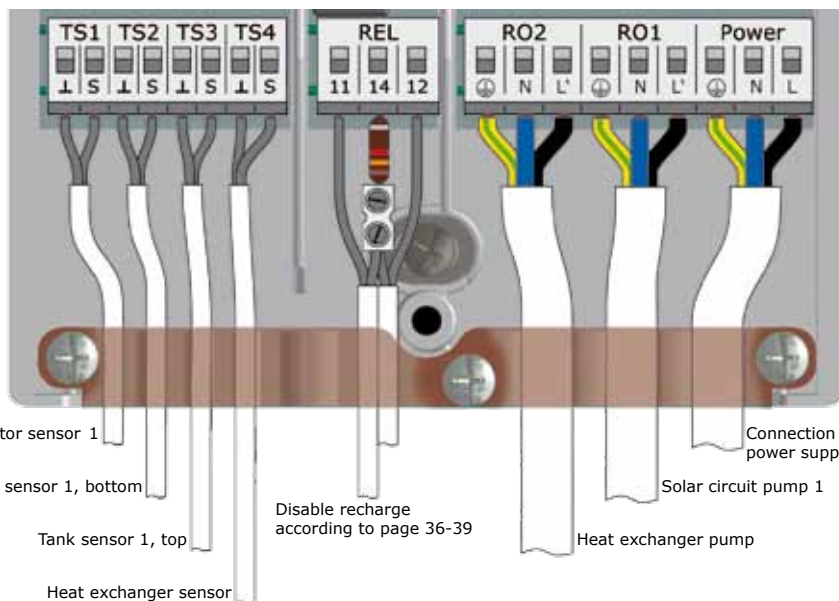
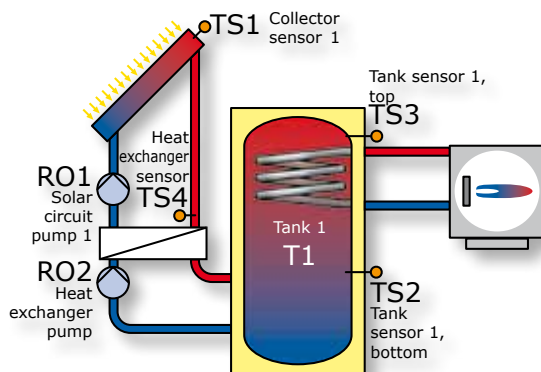


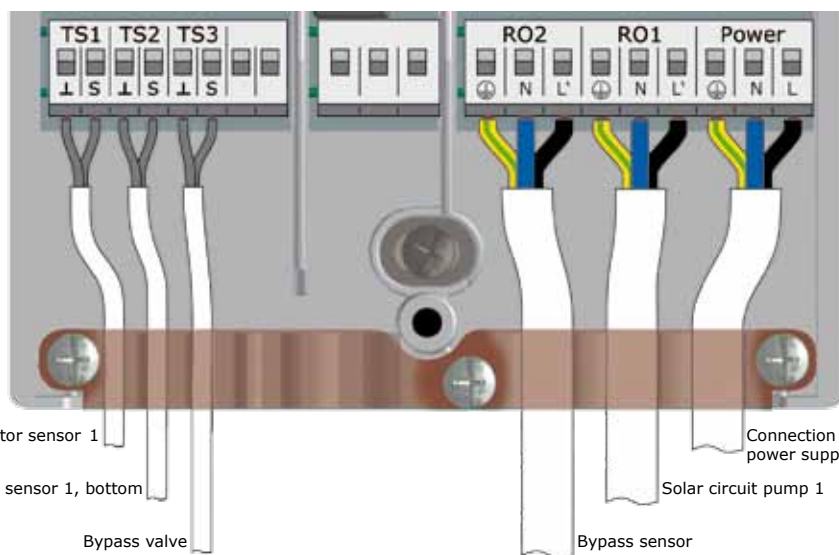
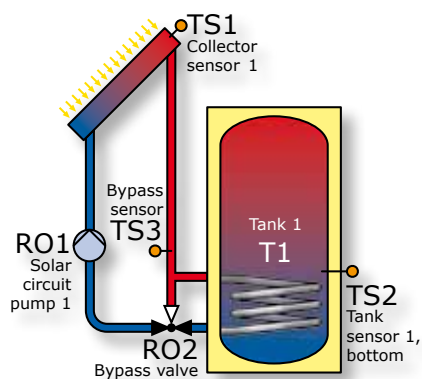


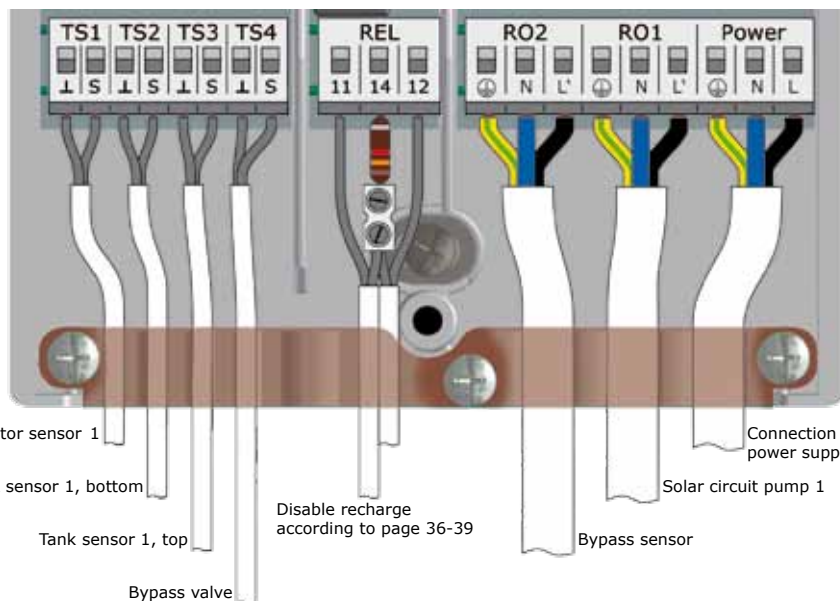
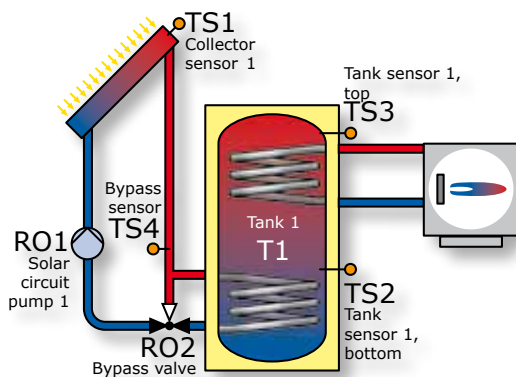


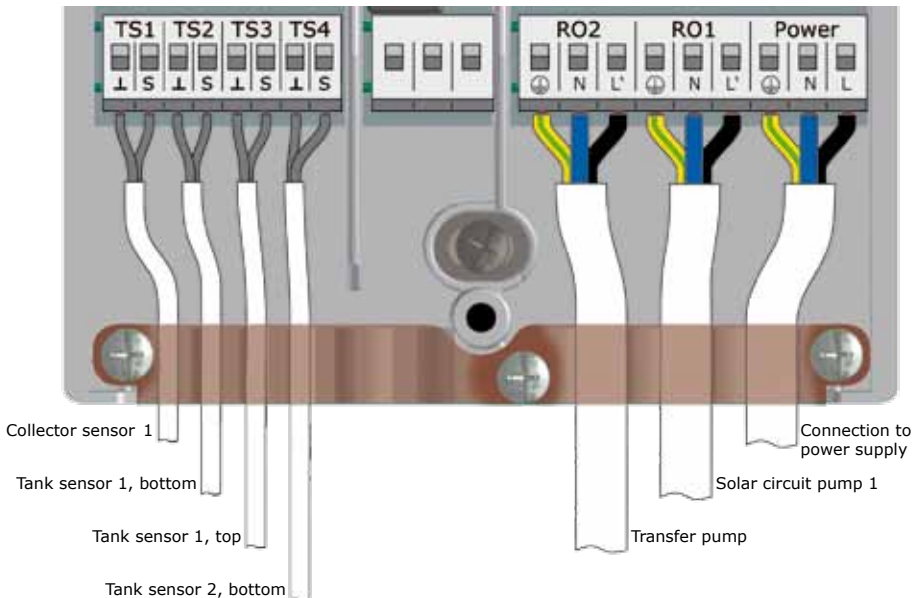
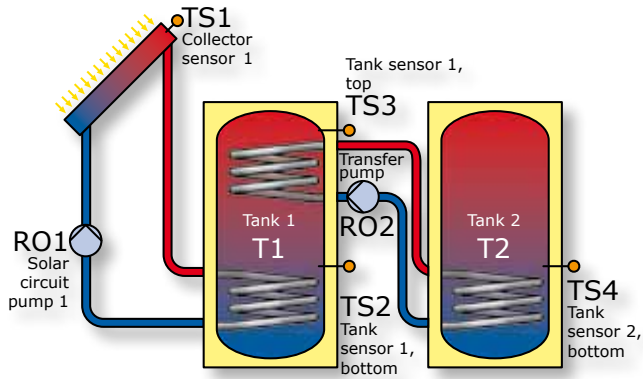


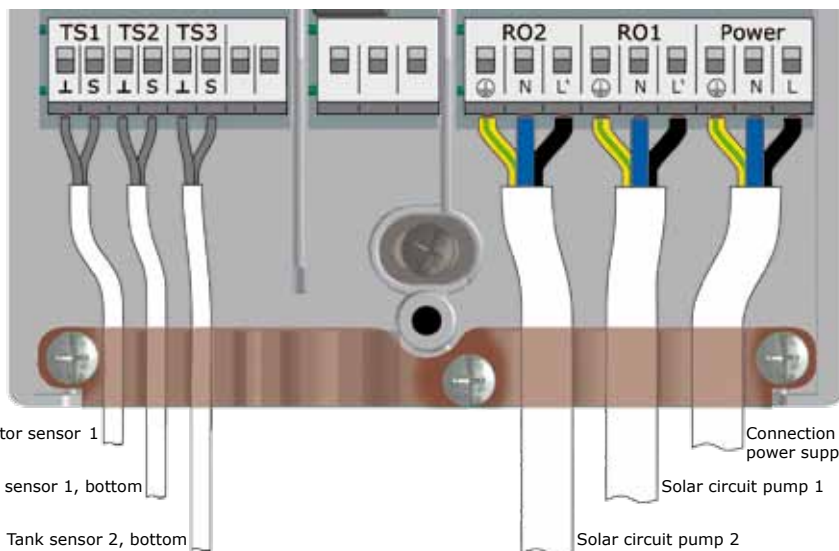
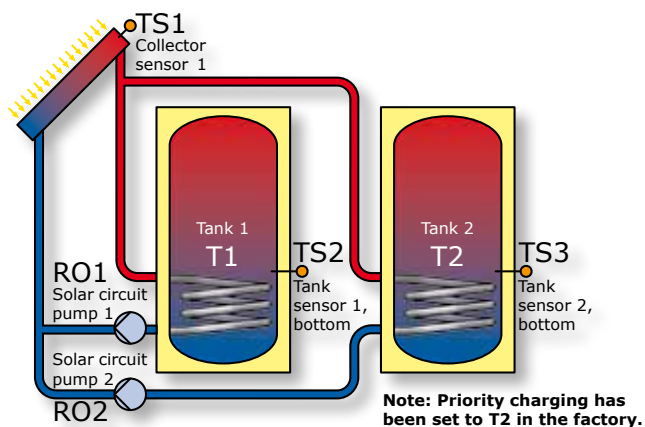


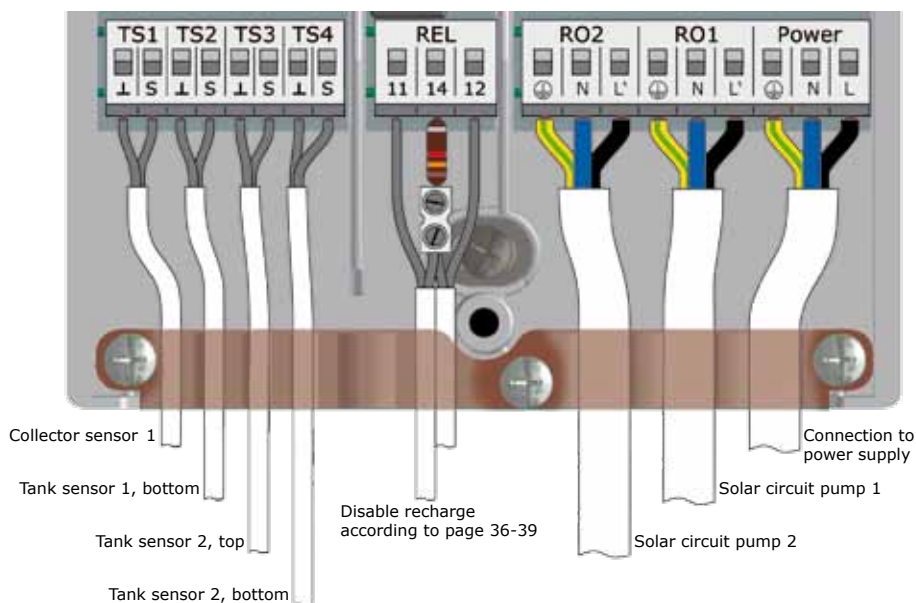
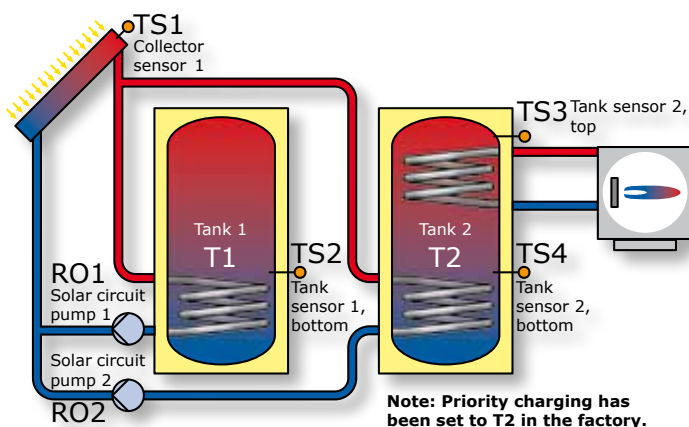


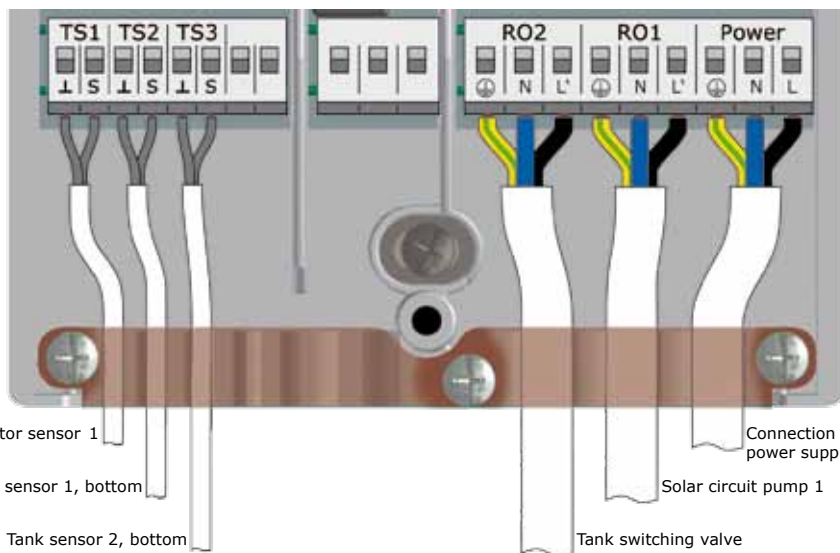
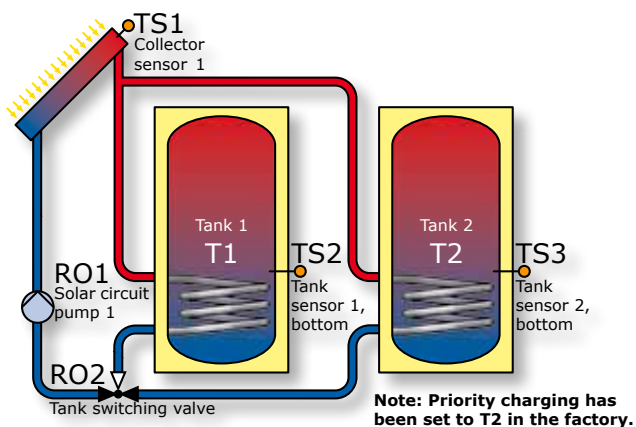


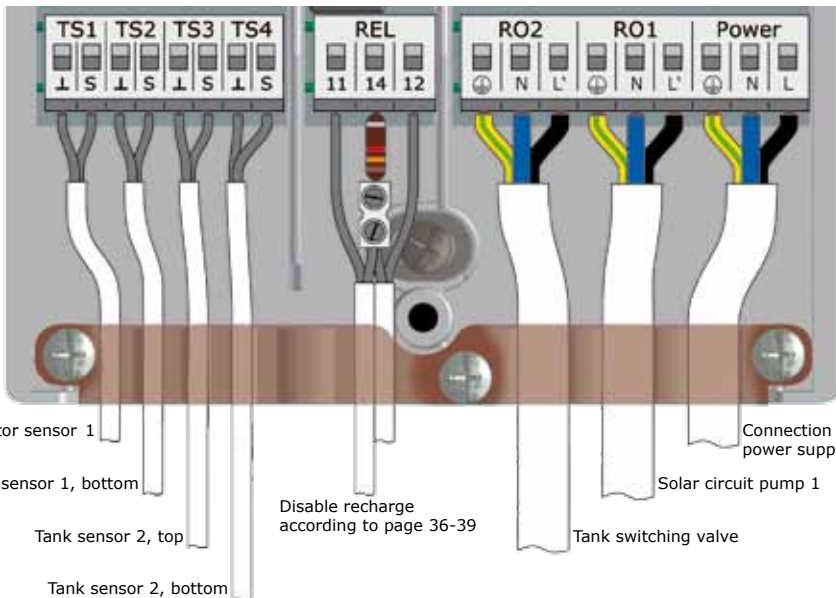
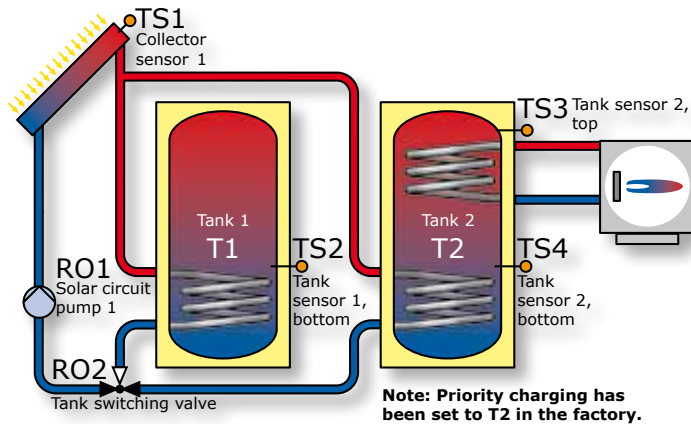


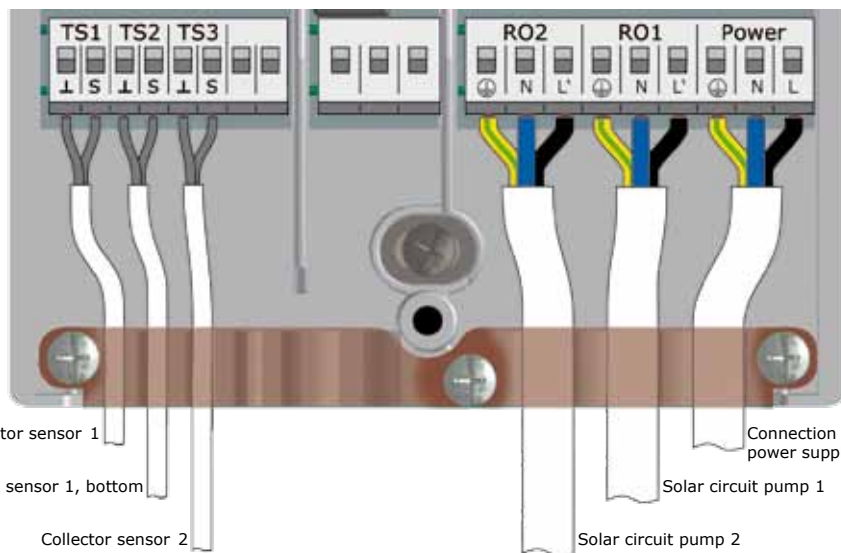
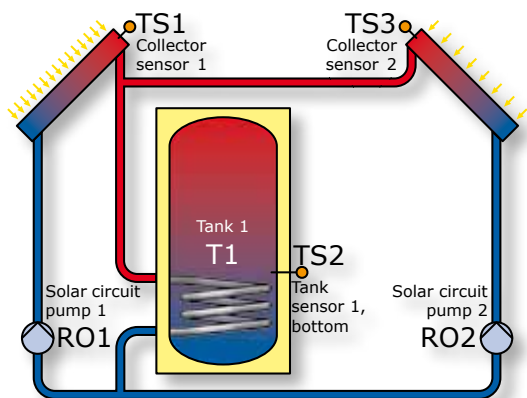


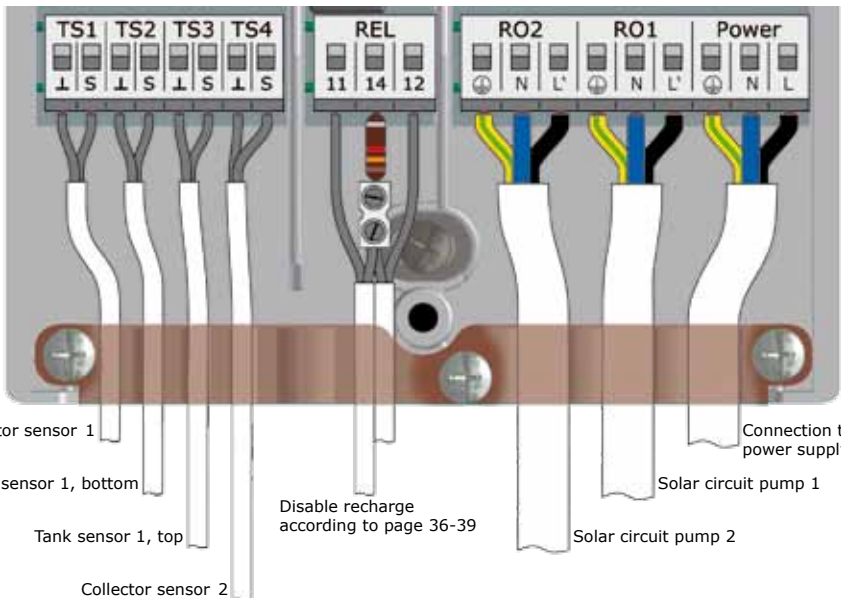
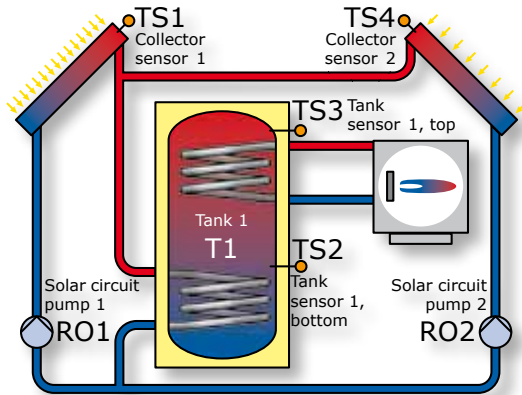












The efficiency of a solar plant increases as the recharge of the tank from the boiler decreases. Consequently, "disable recharge" means that recharging of the water tank is blocked by the boiler.

The disable recharge function is possible for the hydraulic systems 2, 6, 8, 11, 13 and 15.

Time-controlled disable recharge

Recharge is blocked by the boiler for specific phases via a time program.

Within the preset period of time (for ex. 7 to 19 h), recharge is blocked completely by the boiler without requiring the minimum temperature to this effect.

Time-/temperature-controlled disable recharge




If a minimum temperature in the tank is exceeded, disable recharge is activated.

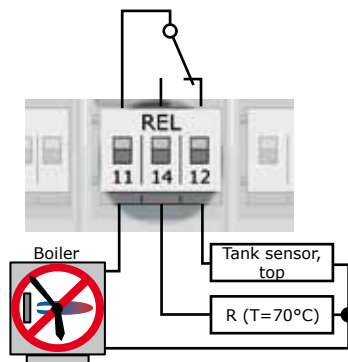
This function can be activated in parallel to the time program.

If the preset minimum temperature (e. g. 45°C) in the tank is exceeded, recharge of the tank is disabled by the boiler.

If, however, the minimum temperature is no longer reached, recharge is enabled by the boiler no matter whether the time program blocks recharge or not.

Check the heating boiler manual to determine which sensor type is used as tank sensor!

Sensor type	Pt 100	Pt 500	Pt 1000
R Terminal 14	130 Ω	620 Ω	1.3 k Ω
Colour code			



All the parameters required for disable recharge are set in professional mode under >1.4.3 disable recharge<.

=> Professional mode as of page 67.

1.4.3 disable recharge

Activ. time progr. ☐

Start 00:00

End 00:00

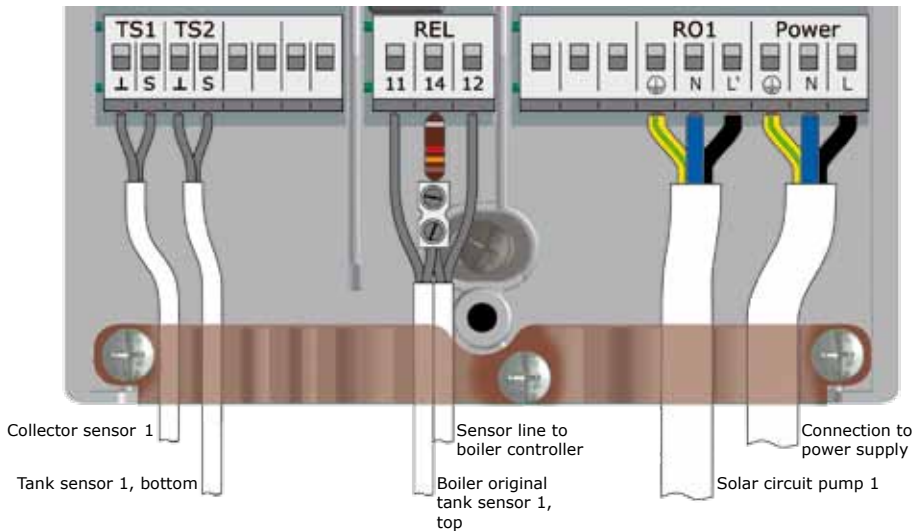
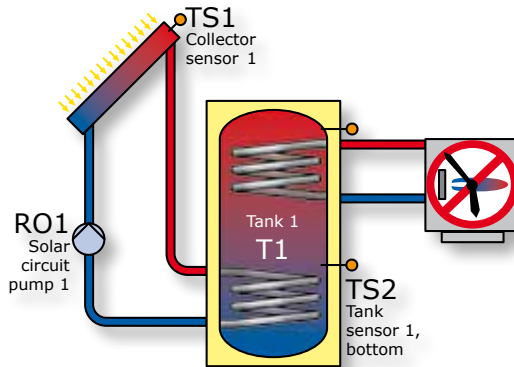
Activation T min. ☐

T min. tank 45.0°C ▼

04.07.2011

10:39

The system 2 is shown here as an example for the time/temperature controlled disable recharge function. Systems 6, 8, 11, 13 and 15 work in an analog manner.






Efficiency-optimized disable recharge

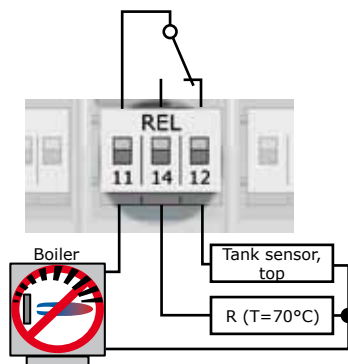
For this disable recharge version, two sensors must be mounted in the position of the upper tank sensor:

- 1.: the original boiler sensor of the heating plant.
- 2.: a Pt 1000 which is connected to TS3 of the **smart Sol**.

Now, a required recharge is optimized via algorithms which take account of various factors such as the energy input and the heat requirements.

Check the heating boiler manual to determine which sensor type is used as tank sensor!

Sensor type	Pt 100	Pt 500	Pt 1000
R Terminal 14	130 Ω	620 Ω	1.3 k Ω
Colour code			



All the parameters required for disable recharge are set in professional mode under >1.4.3 disable recharge<.

=> Professional mode as of page 67.

1.4.3 disable recharge



Activ. time progr. ☐

Start 00:00

End 00:00

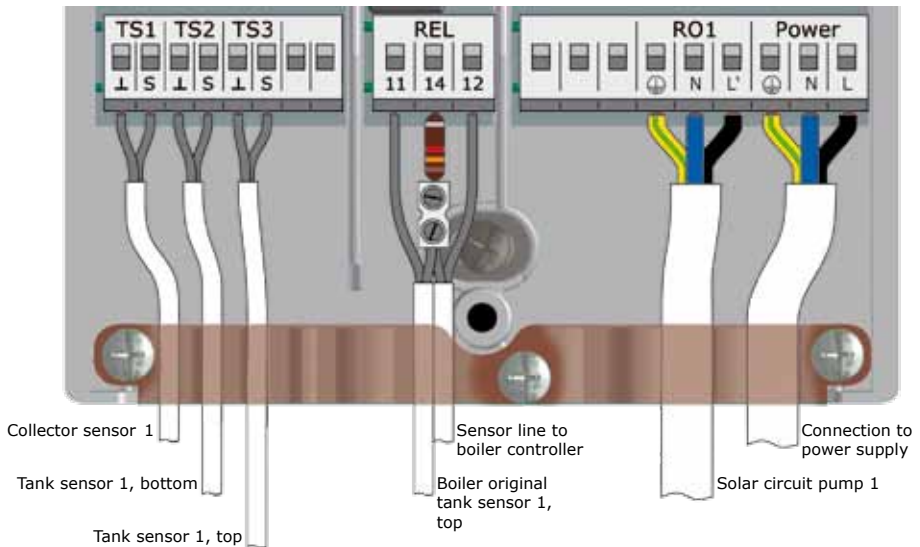
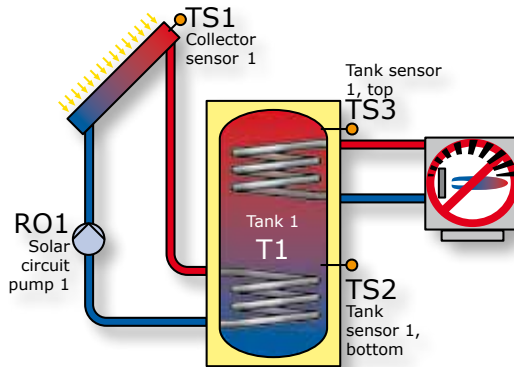
Activation T min. ☐

T min. tank 45.0°C ▼

04.07.2011

10:39

The system 2 is shown here as an example for the efficiency-optimized disable recharge function. Systems 6, 8, 11, 13 and 15 work in an analog manner.



In a specific equipment version (with an extension module), the differential temperature controller **smart Sol** can be connected to the soft water station AQA solar of BWT Wassertechnik GmbH, Schriesheim.

AQA solar is a decalcification plant based on an ion exchanger, which ensures that the water lines and heat exchangers in your home are not damaged by scaling.

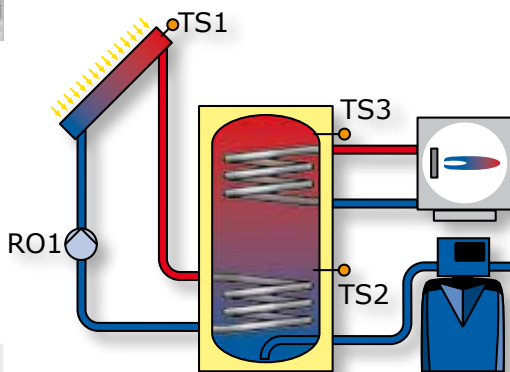
In case of very intense temporary heating of the drinking water, especially with thermal solar systems, decalcification is very useful to maintain efficiency.

Setup and operation of the equipment combination **smart Sol** and AQA solar is described in separate documentation and/or the operating manual of BWT.



For connection, the terminals >Tx<, >Rx< and >Gnd< above the interface terminals TS1 to TS4 are provided on the extension modules.

Integration of the soft water station is possible in all hydraulic systems of the **smart Sol**, and is displayed, e. g.:



1.8 AQA solar

Soft water ☒

Flow rate 421l/h

Soft water delivery 317m³

04.07.2011

10:30

In the main menu, information transmitted by the soft water station can be retrieved under >1.8 AQA solar<.

Important!

For commissioning, the controller must be assembled correctly, all inputs and outputs must be connected and ready for operation, the strain relief device must be screw-fastened and the terminal cover closed!



This is an explanation in terms of an example of commissioning of the differential temperature controller **smart Sol**; details vary along with the hydraulic configuration and the software version.

Commissioning is communicated in plain text; the user must make a selection, acknowledge and - if applicable - jump to the next menu item.

The differential temperature controller **smart Sol** accompanies you during the entire configuration and interrogates everything it must know for optimum operation.

Now, the power supply of the controller must be switched on, or the earth contact plug of the supply cable inserted in a plugbox - the display screen appears.

0.1 Language	
Deutsch	<input checked="" type="checkbox"/>
English	<input type="checkbox"/>
Français	<input type="checkbox"/>
Italiano	<input type="checkbox"/>
Next ►	
04.07.2011	09:12

>0.1 Language< appears after a short booting sequence.

Various languages are available in this version of the **smart Sol**.

Activate the required version and acknowledge by pressing >Next<.

0.2 Time/Date	
Time	09:51
Date	04.07.2011
Next ►	
04.07.2011	09:12

>0.2 Time/date< appears.

Press >OK< - the hour is highlighted in colour.

Turn the rotary encoder until the correct figure appears, and acknowledge via the >OK< button.

The controller accepts the value and jumps to the minute setting.

In this way, all values for time and date can be entered, and acknowledged by >Next<.

>0.3 Inputs< appears.

Select and activate the input interfaces TS1 to TS4 used and assign the selected function to them by scrolling.

Once all inputs have been assigned correctly, acknowledge by pressing >Continue<.

0.3 Inputs	
TS1	---
	Coll 1
TS2	---

TS3	---

04.07.2011	09:12



Important!

At the interface TS4, an impeller sensor can be selected as flowmeter via >Impeller<.

>0.4 Volumetric flow< appears.

If TS4 has already been assigned to >Impeller<, >Impeller< will appear here in terms of sensor system. The number of pulses per litre still has to be selected. If the assignment of TS4 is different or if no assignment has been made, only a vortex can be selected here. To this effect, the installed vortex volumetric flow sensor still has to be defined.

Acknowledge by pressing >Next<.

0.4 Volumetric flow	
Sensor system	Impeller
Pulses/litre	14Imp/l
	Next
04.07.2011	09:13



Important!

A high-efficiency pump can be connected to TS4. The WILO ST 25/7 PWM is preassigned.

0.5 Outputs

RO1	---
RO2	---
REL	---
Next	

04.07.2011

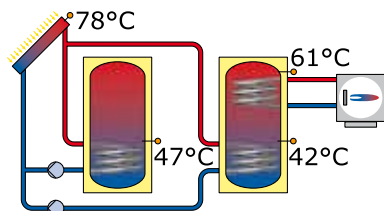
09:13

>0.5 Outputs< appears.

Select and activate the output interfaces RO1, RO2, REL used and assign them to the selected function by scrolling.

Once all outputs have been assigned correctly, acknowledge by pressing >Next<.

System 2/3



04.07.2011

09:13

Now, the controller offers the hydraulic systems which are possible due to the assigned inputs and the selected outputs.

By turning the rotary encoder, the required system can be selected (here system 2 of 3 possible ones) and acknowledged via the button >OK<.

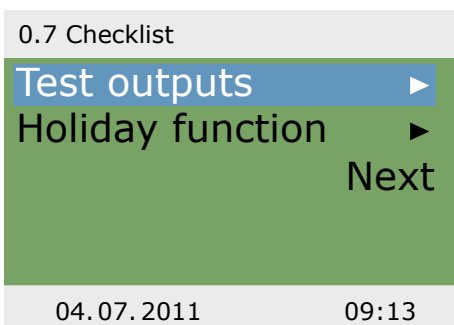
Note!

Here, access to all plant layouts is possible for testing purposes via the option >Show all<. However, for correct operation, one of the plant layouts suggested by the controller must be selected.



>0.7 Checklist< appears.

Here, the output test is offered first - call up the test by pressing the button >OK<.

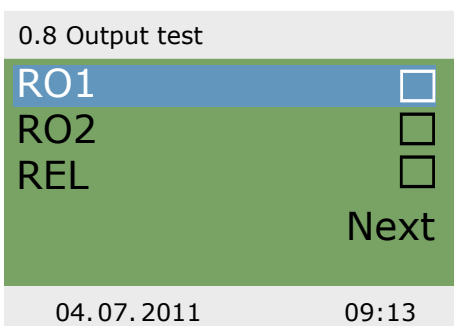


>0.8 Output test< appears.

Here, the outputs can be activated manually via the >OK< button to test the function of the activated output or of the connected unit.

If not all pumps and valves are working properly, the plant elements in question and the cabling must be verified and repaired.

Acknowledge by pressing >Next<.

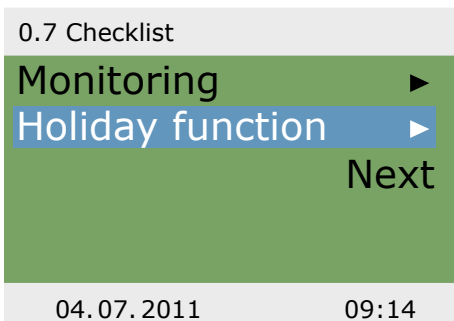


>0.7 Checklist< reappears.

As the plant, when not in use, is only supplied with heat, but no heat is withdrawn, it may be subject to overheating and damage.

Thus, a >holiday function< was programmed which minimizes heat input.

Here, the holiday function can be set - call up by pressing the >OK< button.



0.7.2 Holiday function

Tank recooling ☐
 Soft charge ☐
 T-ON 120.0°C
 T-OFF 100.0°C

Next ►

04.07.2011

09:14

Various options can be selected for the holiday function.

At lower ambient temperatures (e. g. at night), tank recooling tries to dissipate heat via the collectors.

The soft charge circuit is designed so that the heat input into the tank is as low as possible.

The appropriate switch-ON and OFF temperatures must be varied as required.

Acknowledge by pressing >Next<.

0.9 End

You have completed commissioning!

Next

04.07.2011

09:15

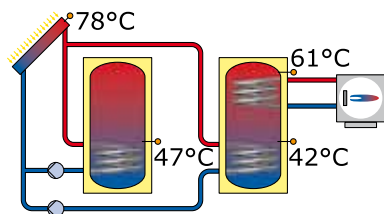
>0.7 Checklist< reappears.

Acknowledge by pressing >Next<.

>0.9 End< appears.

By >Next<, the controller changes over to >Automatic mode<.

System 11



04.07.2011

09:16

Commissioning is complete.

As of this point, the **smart Sol** controls the solar thermal plant automatically.

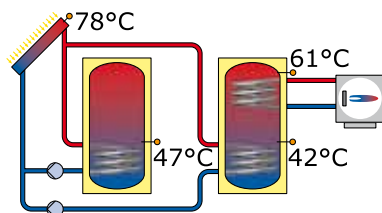
In automatic mode, the screen displays the date, the time and the active hydraulic system.

The current temperature is displayed for each temperature sensor.

The pump activity is displayed on the display as animation.

There is no need for intervention by the fitter or operator.

System 11



04.07.2011

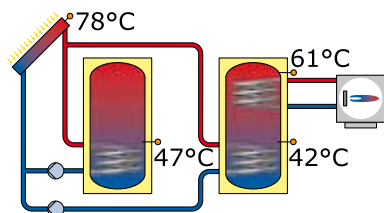
09:17



Note!

Check the display screen of the **smart Sol** on a regular basis to be able to eliminate any malfunctions promptly!

System 11



On the controller, the user can make various settings and obtain information about states and processes.

To this effect, press the button >OK< in automatic mode.

04.07.2011

10:19

1 Main menu

- Evaluation ▶
- Settings ▶
- Basic functions ▶
- Efficiency functions ▶
- Protective funct. ▶▼

>1 Main menu< appears.

A list of subitems appears

By scrolling ...

04.07.2011

10:19

1 Main menu

- Protective funct. ▶▲
- Monitoring ▶
- Login ▶
- AQA solar ▶
- about smart Sol ▶

...the lower part of the menu is displayed.

Once the first subitem

>Evaluation< is selected, ...

04.07.2011

10:19

...>1.1 Evaluation< appears.
 Another selection level appears.
 Once the first subitem
 >Measured values< is selected, ...

1.1 Evaluation

Measured values ▶▲

Service hours ▶

CO2 savings ▶

Heat quantities ▶

Error list ▶

04.07.2011

10:20

...>1.1.1 Measured values< appears.
 Here, the temperatures and dates
 concerning the controller are displayed.
 By scrolling ...

1.1.1 Measured values

Coll 1 78.2°C

Tank 1 bottom 47.0°C

Tank 2 bottom 42.1°C

Tank 2 top 61.4°C

Flow temp. 68.7°C▼

04.07.2011

10:20

...the lower part of the menu
 (if available) is displayed.
 Return to >1.1 Evaluation<.
 Once the second subitem
 >Service hours< is selected, ...

1.1.1 Measured values

Flow temp. 68.7°C▲

Flow rate 1.3l/min

Solar pump 1 34%

Tank ch.-over v 1 OFF

Disable recharge OFF

04.07.2011

10:20

1.1.2 Service hours

Solar pump 1 112h
 Tank ch.-over v 1 94h
 Disable recharge 361h
 Reset

04.07.2011

10:21

...>1.1.2 Service hours< appears.

The operating time of the activated plant components is displayed in hours.

By actuating the menu item >Reset<, all counters are reset to zero.

The values are saved once per day, so that one day max. is "lost" in case of failure of the power supply.

Return to >1.1 Evaluation<.

Once the third subitem >CO2 savings< is selected, ...

1.1.3 CO2 savings

Activation ☒
 Savings 447 kg
 Reset
 Fuel Natural gas

04.07.2011

10:21

...>1.1.3 CO2 savings< appears.

Here, assessment of the saved carbon dioxide can be activated, read and reset.

By selecting >Fuel<...

Edit

Fuel
 Natural gas
 Restore last value
 Factory settings

04.07.2011

10:22

...>Edit< appears.

Here, the fuel types natural gas or fuel oil can be selected for a calculation of CO₂.

Return to >1.1 Evaluation<.

Continue with >Heat quantities<.

>1.1.4 Heat quantities< appears.

Activation starts a counter which determines the heat yield of the solar plant.

Press >Reset< to reset the counter to 0.

The evaluation period can be selected via the >Diagram< - >Week<, >Month< or >Year<

The evaluation appears as a bar graph.

Continue with >Error list<.

>1.1.5 Error list< appears.

Here, a table of the last errors occurred appears for information.

By selecting a fault ...

1.1.4 Heat quantities

Activation ☒

Diagram

Week

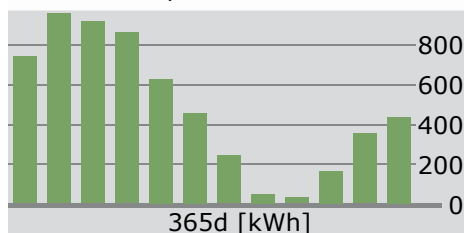
Heat quantity 108 kWh

Reset

04.07.2011

10:22

1.1.4 Heat quantities



04.07.2011

10:22

1.1.5 Error list

M05: 4:31 03.07

M08: 6:44 03.07

04.07.2011

10:22

1.1.5 Error list

M05:
Sensor short-circuit
on TS3!
 Press ESC to return

04.07.2011

10:22

... the error message appears in plain text.
 If necessary, take the appropriate measures.
 Return to >1 Main menu<.
 Continue with >Settings<.

1.2 Settings

Date/Time ▶
 Language ▶
 Display ▶
 Rem.SD card safely
 Factory settings

04.07.2011

10:24

>1.2 Settings< appears.
 Another selection level appears.
 Once the first subitem
 >Date/Time< is selected, ...

1.2.1 Date settings

Date 04.07.2011
Time 10:23

04.07.2011

10:23

...>1.2.1 Date settings< appears.
 Here, date and time can be set in
 case of deviation or an extended
 period of deenergizing.
 Select the subitem
 >Date< or >Time< by pressing >OK<.

One group of figures each is activated and can be varied via the rotary encoder; whenever ›OK‹ is pressed, the activation jumps to the next group.

Return to ›1.2 Settings‹.

Continue with ›Language‹.

›0.1 Language‹ appears.

Here, the user can change over to another available language.

Additional languages can be added to the controller as required.

Continue with ›Display‹.

›1.2.7 Display‹ appears.

›Brightness‹ serves to adjust the backlighting of the display in steps of 10% from 10% to 100%.

›Blanking time‹ is used to determine the time after which, in case of inactivity, backlighting is reduced from the set value to 10%. Adjustable in the range from 30 to 255 seconds.

Return to ›1.2 Settings‹.

1.2.1 Date settings

Date 04.07.2011
Time 10:23

04.07.2011

10:23

0.1 Language

Deutsch ☒
English ☐
Français ☐
Italiano ☐

04.07.2011

10:23

1.2.7 Display

Brightness 100%
Blanking time 180s

04.07.2011

10:23

1.2 Settings

Date/Time ▶
 Language ▶
 Display ▶
 Rem.SD card safely
 Factory settings

04.07.2011

10:24

Before the micro SD card can be removed, ›Remove SD card safely‹ must have been selected.

The last menu item is ›Factory settings‹.

By selecting and pressing the button ›OK‹, followed by ›esc‹, the preset values are deleted and replaced by the factory settings.

Return to ›1 Main menu‹.

Continue with ›Basic functions‹.

1.3 Basic functions

Thermostat ▶▲
 Tube collector ▶
 Holiday function ▶
 Delta T control ▶
 Fixed T control ▶

04.07.2011

10:25

›1.3 Basic functions‹ appears.

Another selection level appears.

Once the first subitem ›Thermostat‹ is selected, ...

1.3.1 Thermostat

Thermostat RO2 ▶
 Thermostat REL ▶

04.07.2011

10:25

...›1.3.1 Thermostat‹ appears.

The controller's free outputs can be used as thermostats for various applications.

In professional mode, presettings must be made to this effect - your fitter will explain the appropriate function to you, if necessary.

By selecting a subitem ...

...the appropriate activation screen is displayed.

Return to >1.3 Basic functions<.

Continue with >Tube collector<.

>1.3.2 Tube collectors< appears.

This option is to be activated in case vacuum tube collectors are used.

Return to >1.3 Basic functions<.

Continue with >Holiday function<.

>1.3.3 Holiday function< appears.

Here, you enter the time of your next holiday. "Holiday" means that the heating/ warm water plant is not used in summer.

In this case, the controller will adapt control for the specified period so that overheating of the plant is prevented.

First select the subitem >Start<, then >End< by pressing >OK<.

1.3.1 Thermostat

Activation ☐

04.07.2011

10:25

1.3.2 Tube collector

Activation ☐

04.07.2011

10:25

1.3.3 Holiday function

Start

19.07.2011

End

02.08.2011

04.07.2011

10:26

Edit
Start
19.07.2011
Restore last value
Factory settings
04.07.2011 10:26

>Edit< appears.

Here, the dates of your absence are entered. Return to >1.3 Basic functions<.

Continue with >Delta T control<.

1.3.5 dT control
dT ON 1 8.0k ▲
dT OFF 1 4.0k
dT ON 2 8.0k
dT OFF 2 4.0k ▼
04.07.2011 10:27

>1.3.5 dT control< appears.

Here, parameters of the controller can be changed.

The factory settings of the **smart Sol** can be used for almost all plants.

Ask a fitter before making changes at this point.

Return to >1.3 Basic functions<.

Continue with >Fixed T control<.

1.3.6 Fixed temperature
T fixed 1 70.0°C
T fixed 2 70.0°C
04.07.2011 10:27

>1.3.6 Fixed temperature< appears.

Here, the temperature values for the collector panels are entered which are to be achieved via control of the pump delivery rate in question.

The factory settings of the **smart Sol** can be used for almost all plants.

Return to >1 Main menu<.

Continue with >Efficiency functions<.

>1.4 Efficiency functions< appears.

Another selection level appears.

Once the first subitem

>disable recharge< is selected, ...

1.4 Efficiency functions

Disable recharge ▶

04.07.2011

10:28

... >1.4.3 disable recharge< appears.

This option must be activated if recharging of the warm water tank is to be switched off as a function of time or temperature.

To this effect, the fitter must make the appropriate presettings.

Return to >1 Main menu<.

Continue with >Protective functions<.

1.4.3 disable recharge

Activation □

04.07.2011

10:28

>1.5 Protective functions< appears.

Another selection level appears.

Continue with >Collector defrost.<.

1.5 Protective functions

Collector defrost. ▶

Tank cooling ▶

Soft charge ▶

04.07.2011

10:29

1.5.2 Defrosting

Activation



04.07.2011

10:29

>1.5.2 Defrosting< appears.

>Defrosting< can be used to heat frozen collectors.

At the same time, the tank is cooled!

This is a one-time action which must be repeated as required.

Return to >1.5 Protective functions<.

Continue with >Tank cooling<.

1.5.5 Cooling functions

Activation



04.07.2011

10:29

>1.5.5 Cooling functions< appears.

This option must be activated if, during a heat wave, the heat input exceeds the energy withdrawal.

In this case, the controller cools the tank via the collectors, e. g. at night.

Return to >1.5 Protective functions<.

Continue with >Soft charge<.

1.5.6 Soft charge

Activation



04.07.2011

10:28

>1.5.6 Soft charge< appears.

This option should be activated if an extended spell of hot, sunny weather is to be expected. Thus, the heat input in the tank is reduced.

Return to >1 Main menu<.

Continue with >Monitoring<.

>1.6 Monitoring< appears.

Here, the error list can be called up.
The required information
appears on the display.

Return to >1 Main menu<.

Continue with >Login<.

1.6 Monitoring

Error list

04.07.2011

10:29

>1.7 Login< appears.

Here, the fitter can enter his/her access code
to perform further settings and changes.

Return to >1 Main menu<.

Continue with >AQA solar<.

1.7 Login

Access code

1

04.07.2011

10:29

>1.8 AQA solar< appears.

This menu is only occupied if the soft
water station >AQA solar< made by BWT
is integrated in the fresh water heating.

For appropriate information,
please refer to the documentation
by BWT / regarding AQA solar.

Return to >Main menu<.

Continue with >About **smart Sol**<.

1.8 AQA solar

Soft water



Flow rate 421l/h

Soft water delivery 317m³

04.07.2011

10:30

1.9 About smart Sol

smart Sol

SW version	3.04
Serial number	089

>1.9 About smart Sol< appears.

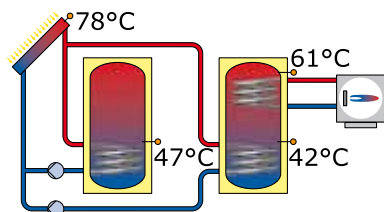
Here, the software version of the controller and the serial number appear.

This information is required for repairs and for version management.

04.07.2011

10:30

System 11



If no entry is made within the preset time (30 - 255 s) on the **smart Sol**, the display returns to >System<.

To return there, you can also push the button >esc<.

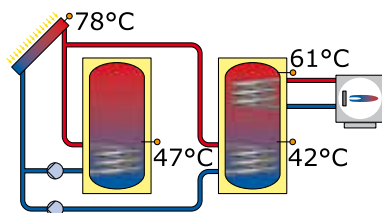
04.07.2011

10:31

The screen on top right shows the >Attention< symbol which points out a notification or an operating malfunction.

Select via >OK<.

System 11



04.07.2011

10:32

If >Safety function< appears in the display, this is a message, no malfunction.

In this case, there is no deficiency, but limits have been exceeded.

The controller indicates that a protective function has been triggered.

The message is only active until normal operation has been restored.

1.10 Service Wizard



Safety function
Solar circuit
emergency cut-off

04.07.2011

10:32



Note!

If a malfunction message appears in the display, the operator can define the possible causes by means of the Service Wizard so that he/she can provide the fitter with precise information.

The differential temperature controller **smart Sol** communicates malfunction processes in plain text. The Service Wizard indicates the possible causes of malfunctions on the basis of the detected symptoms and thus supports immediate and comfortable detection of deficiencies.

There may be various deficiencies in a solar thermal system, which require a wide variety of approaches. The controller communicates every step to the operator or fitter via the screen, so that there is no need to describe all malfunctions in detail in this operating manual.

Here, a malfunction message with troubleshooting process is presented as an example.

Danger!

Mortal danger due to electrocution!

For troubleshooting on the plant, disconnect all poles of the power supply reliably and protect it them against being switched on again!



1.10 Service Wizard



M02:
Breakage of
sensor on TS1!
Menu Next

04.07.2011

10:33

>1.10 Service Wizard< appears.

The malfunction appears in plan text - here:

>M02: Breakage of sensor on TS1!<.

If an analysis/repair is not required at present, press >Menu< to return to the main menu.

1.10 Service Wizard



M02:
Breakage of
sensor on TS1!
Menu Next

04.07.2011

10:33

The Service Wizard helps detect possible causes of malfunctions.

Acknowledge by pressing >Next<.

1.10 Service Wizard



Possible reasons:
Cable/connection ☐
Sensor ☐
Exit

04.07.2011

10:33

For this malfunction, the following causes are assumed: >Cable/connection< or >Sensor< - select the first menu item and confirm by pressing >OK<.

The controller here provides the troubleshooting instruction to check the connection cable.

Perform the measure in accordance with the recommendation.

Acknowledge by pressing >Next<.

More detailed instructions are available if required.

Acknowledge by pressing >Next<.

The troubleshooting result is interrogated.

Continue via >Yes< for the case that the malfunction has been determined.

1.10 Service Wizard



Please check the connection cable to the sensor.

Next

04.07.2011

10:33

1.10 Service Wizard



Disconnect it and measure its resistor.

Next

04.07.2011

10:33

1.10 Service Wizard



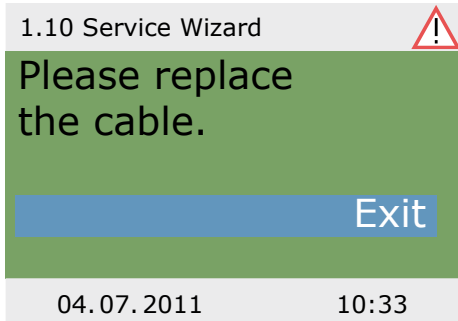
Could you detect a short-circuit / cable break?

No

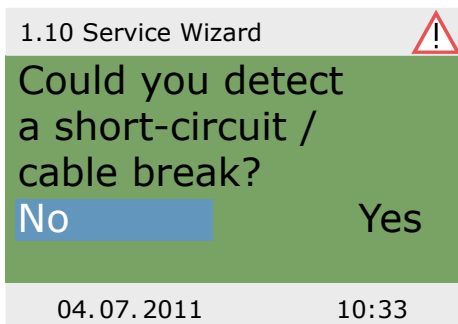
Yes

04.07.2011

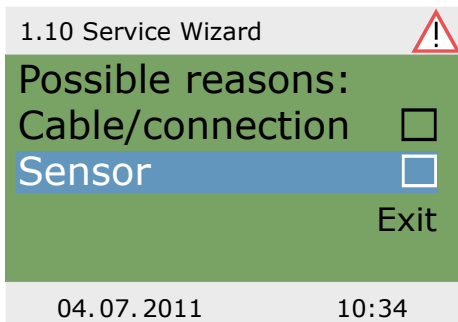
10:33



Repair information appears.
Perform the appropriate repair work.
Exit the >Service Wizard<
by pressing >Exit<.



If the cause of the malfunction
has not yet been determined,
troubleshooting can be continued.
Continue with >No<.



Select all the sources of malfunctions
listed, and confirm via >OK<.

Appropriate instructions appear for each source of faults.

Perform the measure in accordance with the recommendation.

Continue with >Explanation<.

A part of the information and instructions may be provided in close detail, so that ...

...the texts may well take several screens.

1.10 Service Wizard



Please check the sensor for plausible values.

Explanation

04.07.2011

10:34

1.10 Service Wizard



Disconnect it and measure its resistor.

Next

04.07.2011

10:34

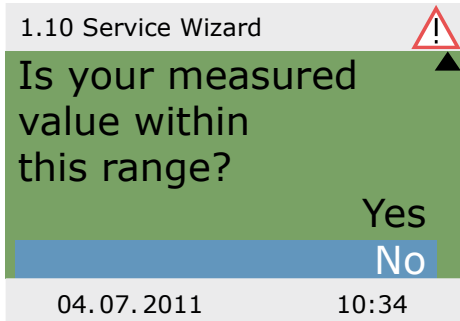
1.10 Service Wizard



With PT 1000 sensors 0°C to 100°C correspond to a resistor of 1000 to 1385 Ohm. ▼

04.07.2011

10:34

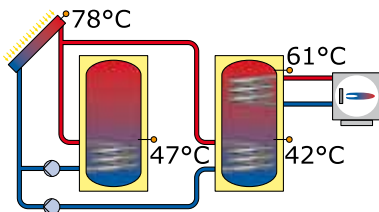


After description of the troubleshooting measure, the result determined by you is interrogated...



... and the appropriate logical conclusion is made, the repair work displayed.

System 11



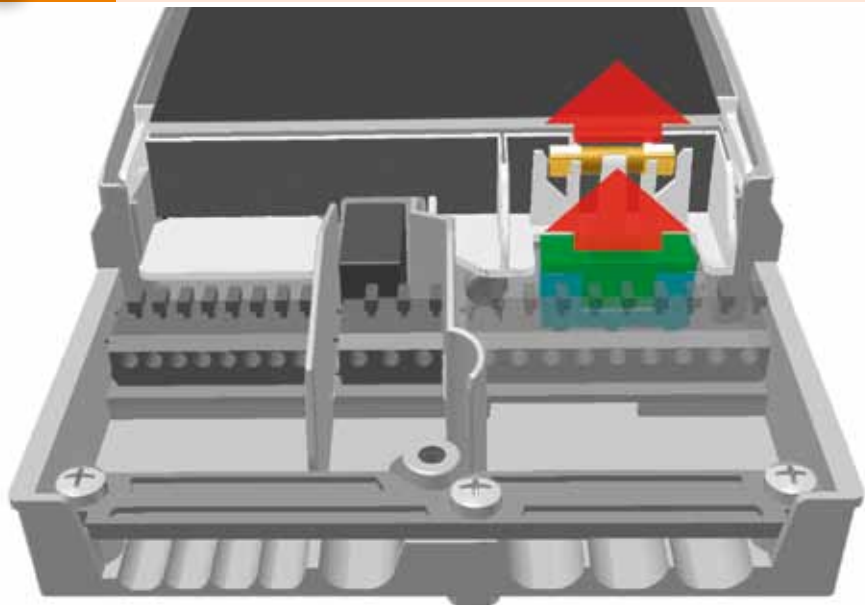
After elimination of the malfunction, the plant screen without the >Attention< symbol appears again on the display, automatic mode is continued.

04.07.2011 10:38



Danger!

Mortal danger due to electrocution! Before opening the terminal cover, disconnect the power supply reliably!



To remove the device fuse, open the terminal cover.
Above the right-hand group of terminals, the fuse base and a spare fuse are located. Pull the upper part of the support and the spare part out.
The fuse link is clamped in the formed piece and is removed together with the plastic holder.



Now, push the micro-fuse laterally out of its holder.
The fuse link is installed by reversing the above order.
Make sure to procure yourself immediately a new spare fuse!



Danger!

Risk of fire due to overload or short-circuit!
Only use fuse links type 5 x 20 mm, T2A!

Important!

In professional mode, settings are made which require detailed knowledge of the heating and solar plant. Moreover, solid specialist knowledge regarding control engineering, hydraulics and solar thermal water heating is required!

If a single parameter is changed, this may affect the safety, function and efficiency of the entire plant!

Leave the settings in professional mode to a specialist workshop, the fitter or heating installer!

Modifications by non-experts tend to result in damage to the plant, rather than to an improvement of its efficiency!



1.7 Login

Access code 1

To enter the professional mode, select >1.7 Login< from the main menu, activate and ...

04.07.2011

10:31

Edit

Access code

365

... enter the access code.

Restore last value

Factory settings

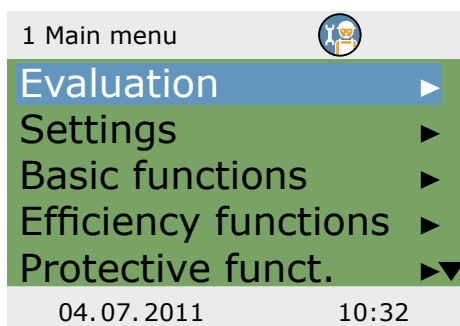
The access code to professional mode is >365<.

The fact that the fitter must be available for his/her customers on 365 days per year may serve as a mnemonic trick.

04.07.2011

10:31

After having returned to >1 Main menu<, the screen shows a list of subitems as in operation mode.



In menu item >1.1 Evaluation<, enhanced setting options for the operation mode are only available in subitem >Heat quantity<.

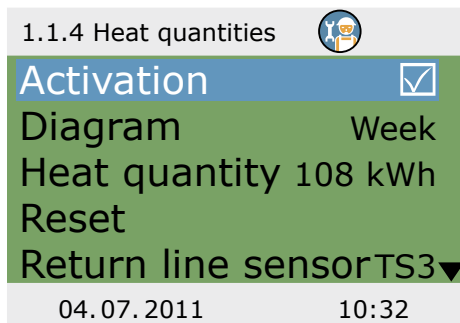
Continue with >Heat quantity<.



Here, precise settings must be made to enable the controller to set up the heat quantity balance as precisely as possible.

The evaluation period can be selected via the >Diagram< - >Week<, >Month< or >Year<.

Continue to scroll.



1.1.4 Heat quantities



Reset
Return line sensorTS3
Supply line sensorTS4
Glycol type

Tyfocor

04.07.2011

10:32

In addition to the operation mode's functions, the sensors in the return and supply lines are assigned.

The filling can be defined as water, Tyfocor, propylene glycol or ethylene glycol.

Continue to scroll.

1.2 Settings



Date/Time
Language
Display
Temp. limitation
Max. temp. shutoff

04.07.2011

10:33

The following items appear under >1.2.

Settings< next to the operation mode menus:

- >Temp. limitation<
- >Max. temp. shutoff<
- >Minimum temperature<

1.2 Settings



Max. temp. shutoff
Min. temperature
priority charging
Summer/winter time
Rem.SD card safely

04.07.2011

10:33

After scrolling:

- >Priority charging<
- >Summer/winter time<

Call up menu item >Temp limitation<.

If the temperature in tank 1 exceeds the value T limit 1, or if the temperature in tank 2 exceeds the value T limit 2, the solar circuit pump is switched off unconditionally.

The pump is not switched on again until the actual temperature falls below the value T limit by the hysteresis >Hyst<.

Example: T limit =60°C minus Hyst=5K
=> Reclosing temperature 55°C.

Continue via the menu item >Max. Temp shut-off<.

Maximum temperature of the tanks 1 and 2, to avoid excessively hot water in the tank; the tank in question is only charged to its >T max<.

In case of collector overheating, the tank can be charged up to >T-limit<.

Continue via the menu item >Minimum temperature<.

To increase efficiency on charging the tanks, the minimum temperature to be present at the collector in question is entered via >T min. Coll<.

The relevant hysteresis value represents the difference between the switch-ON and switch-OFF temperature.

Continue via the menu item >Priority charge<.

1.2.3 Temp limitation



Hyst.	5.0K
T limit 1	60.0°C
T limit 2	60.0°C

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10:34

1.2.5 Max. temperature



T max. tank 1	60.0°C
T max. tank 2	60.0°C

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10:34

1.2.6 Min. temperature



Activation	<input checked="" type="checkbox"/>
T min. Coll 1	20.0°C
T min. Coll 2	20.0°C
Hyst. Coll. 1	2.0K
Hyst. Coll. 2	2.0K

04.07.2011

10:34

1.2.8 Priority charge



Priority	Parallel charge
t pause	2min
t charge	20min
dT Coll.	2.0K

04.07.2011

10:34

In case of dual-tank systems, the tank to be charged first is defined: tank 1, tank 2 or parallel charging.

>t pause< is used to set the pause time between two switch-ON tests.

>t charge< serves to define the charging time for the secondary tank.

Once >dT Coll< is reached, the pause time is restarted.

Continue via the menu item >Summer/Winter time<.

1.2.10 Summer time



Activation
<input type="checkbox"/>



04.07.2011

10:34

If the differential temperature controller is installed in a location where there is summer time, the offset can be activated here.

Return to >Main menu<.

Continue with >Basic functions<.

1.3 Basic functions



Thermostat
Output parameter
Tube collector
Holiday function
Collector cooling

04.07.2011

10:35


The following items appear under >1.3. Basic functions< next to the operation mode menus:

- >Thermostat<
- >Output parameter<
- >Collector cooling< ...

... and enhanced menus regarding the

- >Holiday function<
- >Delta T control<
- >Fixed T control<

Call up the menu item >Thermostat<.


1.3 Basic functions 

Holiday function ▶▲
 Collector cooling ▶
 Commissioning ▶
 Delta T control ▶
Fixed T control ▶

04.07.2011
10:35

If outputs on the controller are not assigned, these channels can be used as thermostats.

Here, the appropriate channel is selected.

1.3.1 Thermostat 

Thermostat RO2 ▶
 Thermostat REL ▶

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10:35


Perform activation.

The output having been defined by selection, the appropriate sensor, the switch-ON and switch-OFF temperatures still have to be set.

For the heating function,
T ON must be < T OFF.

For the cooling function,
T ON must be > T OFF.


Continue to scroll.

1.3.1 Thermostat 


Activation ☐

Sensor TS3
 Output RO2
 T ON 40.0°C
 T OFF 55.0°C▼


04.07.2011
10:35

1.3.1 Thermostat 	
t ON 1	00:00 ▲
t ON 2	00:00
t ON 3	00:00
t ON 4	00:00
t OFF 1	00:00 ▼
04.07.2011	10:35

Up to four time slots can be assigned to each thermostat function. First of all, define the switch-ON times. Continue to scroll.

1.3.1 Thermostat 	
t OFF 2	00:00 ▲
t OFF 3	00:00
t OFF 4	00:00
Start	Timer ▼
04.07.2011	10:35

Then, define the switch-OFF times. As start signal, the timer, timer-thermostat or temperature-thermostat thereof can be set. Continue via the menu item >Output parameter<.

1.3.7 Output parameter 	
Solar pump 1	▶
Tank ch.-over v 1	▶
Disable recharge	▶
t tear-off	10s
n tear-off	100% ▼
04.07.2011	10:35

Here, the general settings for the assigned outputs are defined. Continue to scroll.

>t tear-off< and >n tear-off< define how long and at which speed the pumps are to run on starting.

Select an output...

...to define the required control algorithm as >dT< or >Fixed T<.

In case of plants with long piping or slow response, overtravel times for the solar circuit, pump and valve can be determined.

Continue to menu item >Tube collector<.

To receive correct measured values from the tube collector system, the pump must be switched ON briefly.

By activation of the function, the solar circuit pump can be started time- and/or temperature-controlled.

The time sequence, the pump ON time and ...

1.3.7 Output parameter

Tank ch.-over v 1	▲
Disable recharge	►
t tear-off	10s
n tear-off	100%
Speed delta	10%

04.07.2011

10:35

1.3.7 Output parameter

Algorithm	dT
Overtravel time	0s

04.07.2011


10:35

1.3.2 Tube collector

Activation	<input type="checkbox"/>
t-ON	10min
t solar 1	20s
n solar 1	100%
t solar 2	20s▼

04.07.2011

10:35

1.3.2 Tube collector 


n solar 2 30% ▲

04.07.2011 10:35

... the pump delivery rate as a percentage value can be entered.

The two time programs are performed one after the other.

Continue via the menu item
>Holiday function<.

1.3.3 Holiday function 

Start 19.07.2011


End 02.08.2011 ▼

04.07.2011 10:35

To avoid overheating of the plant, the controller will suppress yield optimization while the holiday function is activated.

The time frame of the holiday function is mostly defined in operation mode.

Continue to scroll.

1.3.3 Holiday function 

Tank cooling ☐ ▲

Start 00:00

End 00:00

Re-cooling T min. tank ▼

04.07.2011 10:35

If tank cooling is activated, an appropriate time frame must be defined - this makes sense during the cooler hours of the night - by allowing the controller to dissipate as much energy as possible via the collectors.

Under >Recooling<, determine whether cooling is to be effected down to >T min tank< or >T max tank<.

Continue to scroll.

Under >n pump< set the pump speed in percent.

Enter the hysteresis value by >Hyst<.

If necessary, activate >Soft charging<

>dT< is used to define the switch-ON temperature for the holiday function as a difference from the preset maximum temperature of the tank.

Via >T-min tank 1< and ...

Continue to scroll.

...>T-min tank 2<, specify the minimum temperature required for the tank in question.

Select whether the >Priority tank< or the >Secondary tank< are to be cooled.

Continue via the menu item >Cooling function<.

Here, collector cooling is activated: once the collector temperature >T max. Coll. 1<, or >T max. Coll. 2< is reached, the appropriate solar circuit pump continues to operate until the tank limit temperature is reached.

Return to >Main menu<.

Continue with >Commissioning<.

1.3.3 Holiday function



n pump	100%▲
Hyst.	5.0K
Soft charge	<input type="checkbox"/>
dT	5.0K
T min tank 1	40.0°C▼

04.07.2011

10:35

1.3.3 Holiday function



dT	5.0K▲
T min tank 1	40.0°C
T min tank 2	40.0°C
Tank	Secondary tank

04.07.2011

10:35

1.3.4 Cooling function



Activation	<input type="checkbox"/>
T max. Coll. 1	120.0°C
T max. Coll. 2	120.0°C

04.07.2011

10:36

0 Welcome



You really want to
start commission.?

No

Yes

Here, new commissioning
can be started - e. g. if a new
hydraulic system is to be selected.

=> >Commissioning mode< as of page 43.

Continue with >Delta T control<.

04.07.2011

10:36

1.3.5 dT control



Activation dT1



dT 1 2.0k

dT ON 1 8.0K

dT OFF 1 4.0K

dT targ. 1 10.0k▼

If control algorithms have been defined as
>dT< under >1.3.1 Output parameter<, the ap-
propriate outputs can be configured here.

Via >dT ON<, the switch-ON temperature,
via >dT OFF<, the switch-OFF temperature and
via >dT targ.<, the target differential
temperature are set. (Differential temperature
between collector and tank, bottom).

Continue with >Fixed T control<.

04.07.2011

10:37

1.3.6 Fixed temperature



Control 2



T fixed 2 70.0°C

If control algorithms have been
defined as >Fixed T< under
>1.3.1 Output parameter<, the
appropriate outputs can be configured here.

In case of the fixed temperature control, the
collector is controlled to the preset tempera-
ture via a variable pump delivery rate.

Continue with >Efficiency functions<.


04.07.2011

10:37

The following items appear under
>1.4. Efficiency functions< next to
the operation mode menus:

- >Low-Flow<
- >Quick-charging<

Call up menu item >Low-Flow<.

1.4 Efficiency functions 

Low-Flow
▶


Quick-charging
▶

Disable recharge
▶

04.07.2011
10:38

Here, the switch-ON temperature
can be defined for low-flow plants.

Continue with >Quick-charging<.

1.4.1 Low-Flow 

Activation
☐

T ON
60.0°C


04.07.2011
10:38

Tank quick charging changes over from
dT control to fixed temperature control.

>T ON< and >T OFF< define the
change-over range and >T targ. Coll.<
the fixed temperature on the collector.

An upper tank sensor is
required for quick-charging.

Continue with >Disable recharge<.

1.4.2 Quick charging 

Activation
☐

Sensors
TS3

T ON
48.0°C

T OFF
52.0°C

T targ. Coll.
70.0°C

04.07.2011
10:38

1.4.3 disable recharge


 Activ. time progr. ☐

Start 00:00

End 00:00

 Activation T min. ☐

T min. tank 45.0°C▼

04.07.2011

10:39

If the plant has been designed accordingly and a system involving disable recharge selected, the appropriate parameters are set here.

Here, the time and/or temperature control is activated - possible for all systems 2, 6, 8, 11, 13, 15.

Time and temperature control can be used in combination.

Select the time slot via >Start< and >End<.

Select the minimum temperature via >T min tank<.

Continue to scroll.

1.4.3 disable recharge



Activat. Tmin float ▲



Factor 1 4.0

Factor 2 2.0

04.07.2011

10:39

Here, the efficiency-optimized disable recharge is enabled and activated - possible for all systems 2, 6, 8, 11, 13, 15.

Set >factor 1<.

Factor 1 weights the expected solar input, factor 2 the absolute level.

By reducing factor 1, the expected solar input gets a higher weighting.

Continue to scroll.

1.4.3 disable recharge



Factor 1 4.0▲

Factor 2 2.0

T floating

upper tank sensor

T min. tank 45.0°C

04.07.2011

10:39

Set >factor 2<.

By reducing factor 2, reaching the tank minimum temperature >T min tank< (at the end of the menu) gets a higher weighting.

Determine under >T floating< whether the temperature is to be measured on the upper or lower tank sensor.

Enter the minimum tank temperature via >T min tank<.

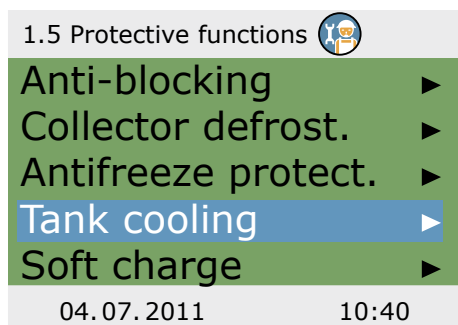
Return to >Main menu<.

Continue with >Protective functions<.

The following items appear under
>1.5. Protective functions< next
to the operation mode menus:

- >Anti-Blocking<
- >Antifreeze protection<

Call up menu item >Anti-Blocking<.

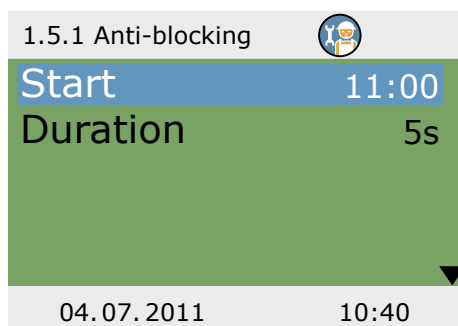


The pumps can be moved daily to
prevent them from getting blocked.

This function is not activated as long as
the pumps are activated in normal operation.

Determine the time of the
day and the operating period.

Continue with >Collector defrosting<.

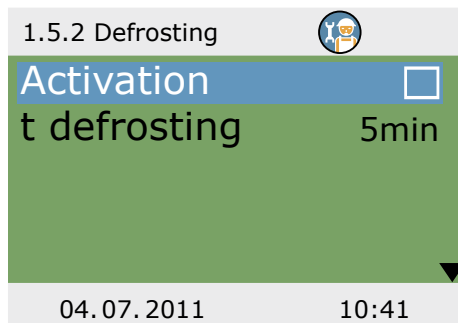


>Defrosting< can be used
to heat frozen collectors.

At the same time, the tank is cooled!

Set the pump runtime.

Continue with >Antifreeze protection<.



1.5.3 Antifreeze

Activation ☐

T ref 5.0°C

T ON 5.0°C

Glycol type

Ethylene glycol▼

04.07.2011

10:42

Activation and setting of the anti-freeze protective function for the collector.

Via >T ON<, enter the anti-freeze protection temperature for water-filled plants.

When anti-freeze products are used, the type and the proportion can be entered; the anti-freeze protection temperature is calculated automatically.

Continue to scroll.

1.5.3 Antifreeze



Glycol type

Ethylene glycol

Glycol portion 40Vol%

Tank

Priority tank▼

04.07.2011

10:42

In the case of plants with two tanks, the source of the anti-freeze protection heat must be selected by specifying >Priority tank< or >Secondary tank<.

Continue with >Cooling function<.

1.5.5 Cooling function

Activation ☐

Hyst. tank 1 2.0K

Hyst. tank 2 2.0K

t-ON 00:00

t OFF 00:00▼

04.07.2011

10:43

Here, collector cooling can be activated once the maximum temperature is exceeded.

The collector is cooled down to >T max Coll<; at the same time, the tank is charged up to max. >T limit<.

>T limit< was determined under >1.2.3 Temp. limitation<.

>T max Coll< was defined under >1.3.4 Cooling function<.

Continue to scroll.

>t ON< and >t OFF< are used to define the appropriate time slot, and >Hyst tank 1< and >Hyst tank 2<, to define the switch-ON hysteresis.

If the adjusting balance is activated, the heat dissipated via the collector is deducted from the energy balance calculation.

Continue with >Soft charge<.

Soft charging sets the plant to protection mode to prevent excessively high tank temperatures.

The start temperatures for two tank circuits and the appropriate calendar period are determined here.

Return to >Main menu<.

Continue with >Monitoring<.

The following items appear under >1.6. Monitoring< next to the operation mode menus:

- >DiffTemp<
- >Coll. Emerg. OFF<
- >Sensor balancing<

Call up the menu item >DiffTemp<.

1.5.5 Cooling function



Hyst. tank 1	2.0K▲
Hyst. tank 2	2.0K
t-ON	00:00
t OFF	00:00

Adjusting balance ☐▼

04.07.2011

10:43

1.5.6 Soft charge



Activation	<input type="checkbox"/>
T min. tank1	45.0°C
T min. tank2	45.0°C
Start	30.05.
End	31.07.

04.07.2011

10:43

1.6 Monitoring



Error list	▶
DiffTemp	▶
Coll. Emerg. OFF	▶
Sensor balancing	▶

04.07.2011

10:44

1.6.2 dT monitoring



dT coll/stor 30.0K
 t max.coll/tank 10min
 dT return/supply 30.0K▼

04.07.2011

10:44

>dT monitoring< is used to define the criteria which lead to fault detection.

>dT coll/stor< is used to define a differential temperature between collector and tank, and >t max.coll/tank< for the relevant period of time.

If >dT coll/stor< is exceeded within >t max.coll/tank<, the controller detects a fault.

Continue to scroll.

1.6.2 dT monitoring



dT return/supply 30.0K▲
 t max. return/suppl. 10min

04.07.2011

10:44

The second fault criterion is defined as follows:

>dT return/supply< is used to define a differential temperature between the return and supply flow, >t max return/supply<, the appropriate period of time.

If >dT return/supply< is exceeded within >t max return/supply<, the controller detects a fault.

Continue with >Coll. Emerg. OFF<.

1.6.4 Emerg. OFF



T limit Coll. 1 130.0°C
 T limit Coll. 2 130.0°C
 Hyst. 5.0K

04.07.2011

10:45

>T limit Coll. 1< or >T limit Coll. 2< are used to switch OFF the appropriate solar circuit pumps to prevent destruction.

Under >Hyst<, the value is entered by which the limit temperature must be undercut to cancel the forced shut-off.

Continue with >Sensor balancing<.

Long piping and other factors may distort measured variables.

Here, an offset value can be entered for each sensor.

If the professional mode is not exited actively, the controller automatically displays the plant layout after the preset display shut-off time and the value of the access code is reset to 1.


Return to >Main menu<.



Continue with >Login<.



Continue with >Manual mode<.

In manual mode, the individual outputs can be activated for testing purposes, e. g. to check that a pump is working properly.

Manual mode can only be exited by pressing ESC.

1.6.5 Sensor balancing 	
TS1 Offset	0.0°C
TS2 Offset	0.0°C
TS3 Offset	0.0°C
TS4 Offset	0.0°C
04.07.2011 10:46	

1.7 Login 	
Access code	365
Manual mode	
04.07.2011 10:47	

1.7.1 Manual mode  	
Solar pump 1	<input type="checkbox"/>
Solar pump 1	100%
Solar pump 1	---
Tank ch.-over v 1	<input type="checkbox"/>
04.07.2011 10:48	

Danger!

Mortal danger due to electrocution!
Before opening the terminal cover,
disconnect all poles of the power supply reliably!



For disassembly of the differential temperature
controller **smart Sol**, reverse assembly procedure:

- Disconnect the power supply / remove the earth contact plug.
- Open the terminal cover.
- Disconnect all cables.
- Release the wall screw fastening.
- Remove the controller from its mounting location.

Danger!

Mortal danger due to electrocution!
When removing the controller, secure all stripped
cable ends so that they cannot be touched by persons!
Remove cables completely on definite removal.



Important!

The person who or the institute which is responsible for disposal of
the device must not discard the controller with the residual waste, but
must ensure correct recycling in accordance with the local provisions!

In case of doubt, ask the local disposal company or the
authorized dealer from which you have purchased the device.



The differential temperature controller **smart Sol** was developed, manufactured and tested according to stringent quality and safety specifications and corresponds to the state of the art.

The device is subject to the warranty period prescribed by law of 2 years after the date of sale.

The seller shall eliminate all defects in material and workmanship which occur on the product during the warranty period and which impair the product's functionality.

Natural wear and tear does not constitute a defect.

Warranty and liability does not include all damage which is due to one or several of the following reasons:

- Non-compliance with these Assembly and Operating Instructions.
- Inappropriate transport.
- Faulty assembly, commissioning, maintenance or operation.
- Modifications of the structure or tampering with the software of the device.
- Installation of supplementary components which are not approved by the manufacturer.
- Continued use of the controller despite an obvious defect.
- Use of non-approved spare parts and accessories.
- Applications exceeding the intended scope of utilization.
- Inappropriate utilization of the device / improper handling, e. g. ESD.
- Use of the device outside of the admissible technical boundaries.
- Voltage surges, e. g. due to lightning strokes.
- Force majeure.

Further claims based on this warranty obligation, especially compensation for damage exceeding the asset value of the differential temperature controller, are excluded.

Construction, design and project engineering of heating installations are performed by specialist fitters based on the applicable standards and directives.

The functioning and safety of a plant are the exclusive responsibility of the companies commissioned with planning and execution.

Contents and illustrations of this manual have been elaborated to the best of our knowledge and with utmost diligence - we reserve the right of error and technical modifications.

Liability of the manufacturer for inappropriate, incomplete or incorrect information and all damage resulting therefrom is excluded on principle.

The contents and representations of these Assembly and Operating Instructions are the intellectual property of emz-Hanauer GmbH & Co.KGaA.

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The rights to any cited brands, names or logos are the property of their appropriate developers / of the licensees in question.

Name of operator and place of installation:

Date of commissioning:

Installed hydraulic system:

Collector surface, in total [m²]:

Tank sizes [l]:

Anti-freeze agent Type/concentration:

Particularities:

The solar thermal plant with the differential temperature controller **smart Sol** has been installed and commissioned in an expert fashion.

The owner / operator of the plant was informed in detail and instructed as regards the design, operation, handling, especially in connection with the differential temperature controller **smart Sol**.

Commissioning by the company (name/address/telephone number):

Name of employee:

Error report



Error pattern/error description:

Error message:

Software version:

Service Wizard executed: ☐ Yes ☐ No

Screens: TS1:

TS2:

TS3:

TS4:

Wiring: RO1: ☐ Pump ☐ HE ☐ Valve

RO2: ☐ Pump ☐ HE ☐ Valve

REL: ☐ Yes ☐ No

Service hours: RO1:

RO2:

REL:

Equipment/Accessories/Options:

Important!


For repair or replacement of the controller, make sure that completed copies of the commissioning report and of the error report are included!



The company

emz-Hanauer GmbH & Co.KGaA
Siemensstrasse 1
D - 92507 Nabburg

declares in its sole responsibility that the following product:

Differential temperature controller  smart Sol

to which this Declaration refers, complies with the following directives and standards:

Directive 2006/95/EC of the European Parliament and the Council dated 12 December 2006 on the harmonization of the laws of the Member States relating to electrical equipment designed for use within certain voltage limits.

Directive 2004/108/EC of the European Parliament and the Council dated 15 December 2004 on harmonization of the laws of the Member States relating to electro-magnetic compatibility and abolition of the Directive 89/336/EEC.

Directive 2001/95/EC of the European Parliament and of the Council dated 3 December 2001 regarding general product safety.

Technical regulations, Low-Voltage Directive:

EN 60730-1:2000

Technical Report no. S34163-00-00TJ, S34163-00-01TJ*

Test institute/Laboratory: mikes-testingpartner GmbH, Strasskirchen

Technical regulations, EMC Directive:

EN 60730-1:2000 + A1:2004 + A12:2003 + A13:2004 + A14:2005 (EMC part)

EN 55022:1998 + Corr. 1999 (Class B)

EN 61000-3-2:1995 + corr. July 1997 + A1: 1998 + A2:1998 + A14:2000

EN 61000-3-3:1995 + A1:2001 + A2:2005

Test Report no. E34488-00-00HP*

Test institute/Laboratory: mikes-testingpartner GmbH, Strasskirchen

*The original test reports are available at emz.

D - 92507 Nabburg, 25.07.2011,

Signed

Thomas Hanauer
Managing Director

i.V. Josef Irlbacher
Group Manager Electronic Development

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